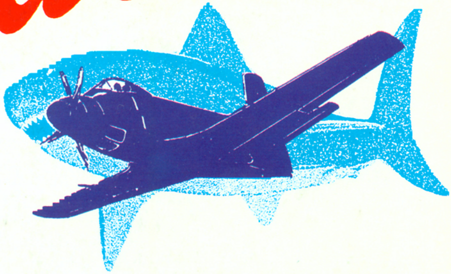
NAVAL FIGHTERS NUMBER FORTY - THREE

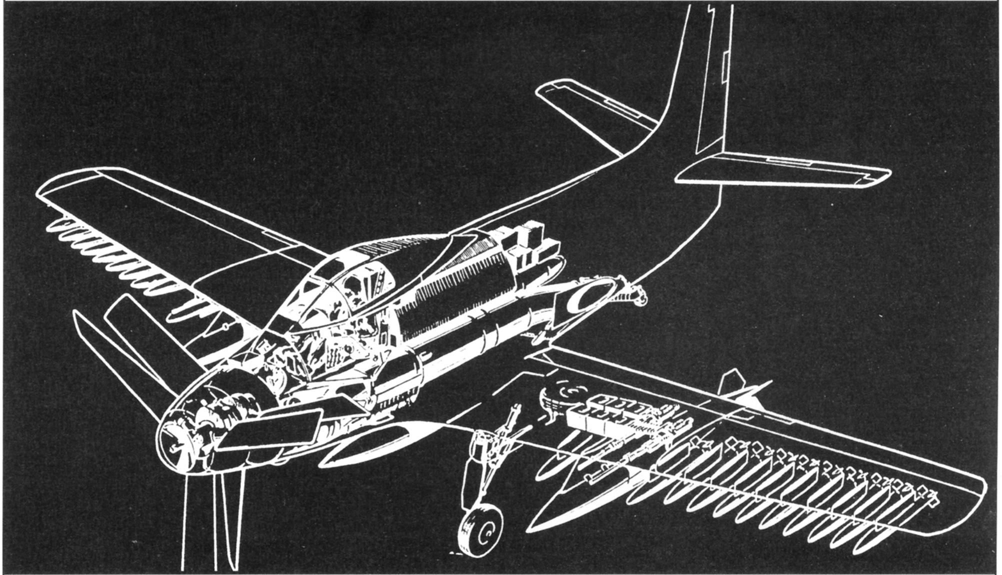
DOUGLAS Skyshark

A2D TURBO-PROP ATTACK

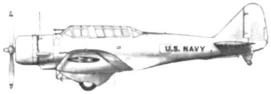


BY GERRY MARKGRAF

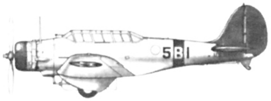
XA2D-1 SKYSHARK GENERAL ARRANGEMENT



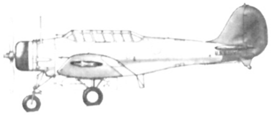
DOUGLAS ATTACK AIRCRAFT XBT-1 THROUGH A2D-1



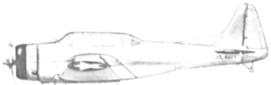
XBT-1



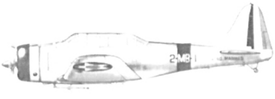
BT-1



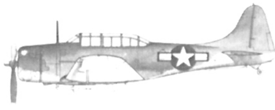
XBT-TRICYCLE



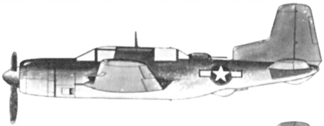
XBT-2



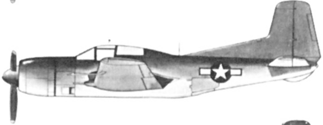
SBD-1, -2, -3, -4, -5



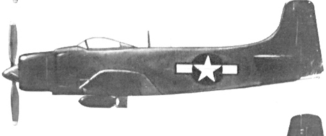
SBD-6



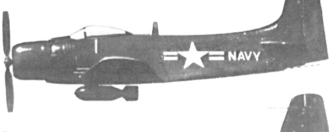
SB2D-1



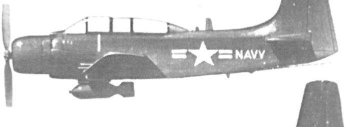
BTD-1



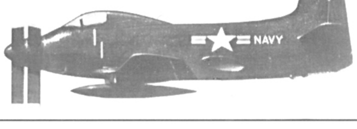
XBT2D-1



AD-1, -2, -3, -4



AD-5



A2D-1

SON OF SPAD: THE DOUGLAS A2D SKYSHARK

Above, original artist's sketch of the Skyshark, which is meant to show the aircraft's high rate-of-climb capability of 7,960 ft./min. Even with the test engines, the A2D could significantly outclimb all Naval aircraft except the F2H-2 Banshee at sea level. (MFR)

INTRODUCTION

The text for this book was originally written by Gerry Markgraf for the Fall 1977 issue of the American Aviation Historical Society Journal Vol. 22 No. 3. The story is just as valid today as when it was written, and is used as the basis for this book. The story was originally called "Skyshark, Son of Spad", hence the "Son of Spad" title at the top of this page. During the late 1940s and early 1950s, the Navy would try just about anything to increase the performance and capability of its aircraft. They would test the Hi-Bred Allison XT-40 not only in the A2D, but in the XA2J-1 Super Savage (see Naval Fighters #22), the vertical takeoff XFY-1 (see Naval Fighters #27) and XFV-1 (see Naval Fighters #32) and the XP5Y-1/R3Y-1/2 Tradewind flying boats (see Naval Fighters # 34). Unfortunately none of these programs were successful save the XP5Y-1/R3Y-1/2, which was eventually terminated by engine/gear box problems. Even though all of the XT-40 programs eventualy ended in cancellation, the lessons learned by Allison allowed them to build the reliable powerplants still being used on Grumman E-2/C-2 and Lockheed P-3 and C-130 aircraft.

This book would not have been possible without the generous support of Harry Gann and Douglas Aircraft Division, from which all material marked (MFR) was obtained. The material provided by Craig Kaston, Wayne Morris and Gerry Markgraf, in most instances, also originated from Douglas. Gerry's research was further aided by Angus Jacks, Rick Koehnen John & Karen Marzal and test pilot George Jansen. For this book, thanks also goes to the staff at the National Archives, and to Jim Burridge.

Anyone having photos or other information on this, or any other naval or marine aircraft, may submit them for possible inclusion in future issues. Any material submitted will become the property of NAVAL FIGHTERS unless prior arrangement is made. Individuals are responsible for security clearance of any material before submission.

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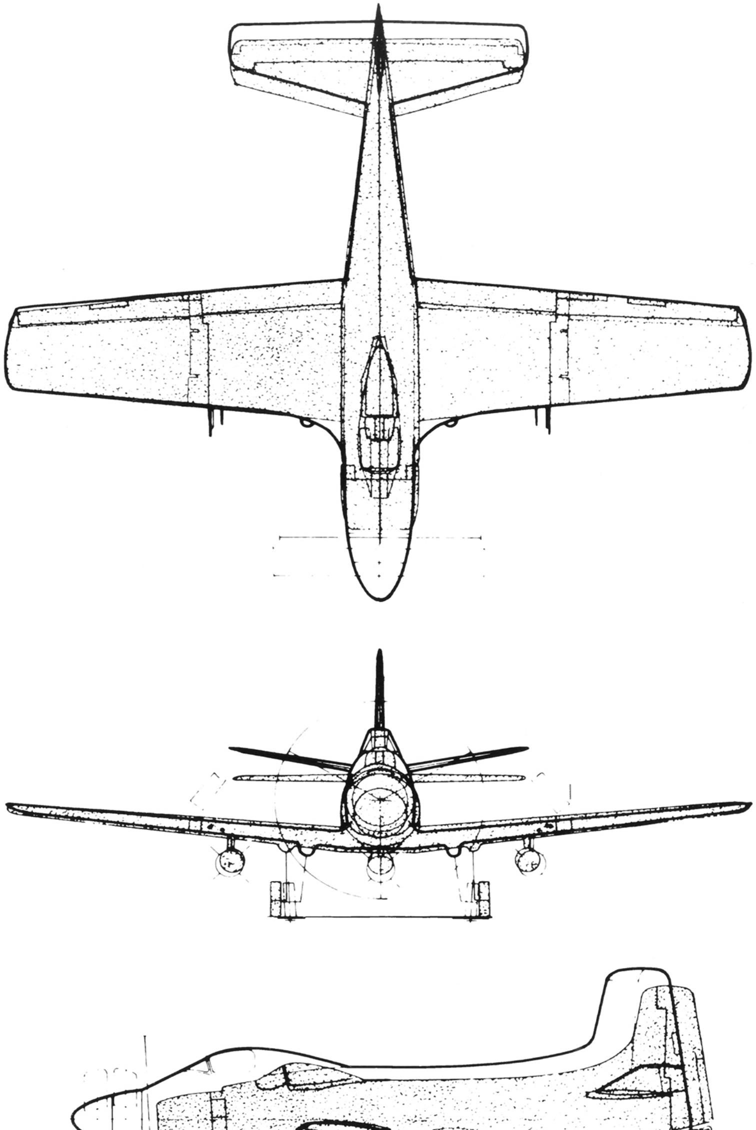
BACKGROUND

Preparations for the initial flight of the prototype Douglas XA2D-1

A2D VERSUS AD GENERAL ARRANGEMENT COMPARISON DRAWING



Skyshark attack aircraft introduced a new sound to the desert around Edwards AFB, California. Jets were becoming commonplace at Edwards in early 1950, but turboprops were then relatively rare and the Skyshark's new Allison XT40-A-2 engines produced an unprecedented amount of power and noise for its type. An indirect effect of the Skyshark's power was soon noticed by personnel working around the aircraft, who found that earplugs provided insufficient protection from the racket. Vibration from the Skyshark's operating engine frequently induced a "buzz" in their bones and joints that made it uncomfortable to remain in the area.

Vibration and other problems associated with the new XT40 were matters of even greater concern to designers working on the project. The Skyshark's first flight date, originally scheduled for March, 1949, had slipped several times due to engine development problems which repeatedly delayed delivery of flight cleared engines. Not until March of 1950 were engines delivered that could be used for flight, and they were restricted to limited flight test only.

On 26 May 1950, George Jansen, a decorated WWII veteran and Douglas test pilot for five years, was finally able to take the prototype XA2D-1 Skyshark up for its first flight. Jansen remembers making a few control inputs to check the aircraft's general handling characteristics, but he was quickly forced to cut the throttle to prevent engine damage. Heavy, low frequency vibrations had been evident throughout the short 2 minute flight which ended on the dry lakebed only 5 miles from the Skyshark's takeoff point.

Obviously, a lot of work still separated the prototype XA2D-1 from an operational product and considerable urgency was lent to this task a few weeks later by the sudden start of the Korean war on 26 June 1950. The new Skyshark had the potential to considerably increase the capability of the U.S. Navy's carrier air wings, which were then operating mostly piston-engined Skyraider and Corsair attack aircraft. Naturally, the Navy wanted its new turbine powered attack aircraft readied for operational service as soon as possible.

A lineal descendent of the successful AD Skyraider (or "SPAD" as the AD was unofficially nicknamed), the XA2D-1 gave little visible clue to its greatly increased capability. The most noticible difference from the Skyraider were the large counter-rotating propellers on the end of the Skyshark's pointed nose. The shape of that nose, a humped back and high fin, combined with shiny blue-black paint, gave the Skyshark an uncanny resemblance to its namesake, the shark, which was perhaps the most striking external evidence of the power potential hidden within the Skyshark's airframe.

INITIAL CONCEPTS

The Navy had scarcely initiated development of XBT2D-1 (prototype of the AD Skyraider series) in 1944 when the operational debut of German and British turbojet fighters served warning that development of new attack aircraft with greatly increased capabilities would soon be necessary. Improved "paper" attack aircraft utilizing the latest developments in piston engines were being considered by various manufacturers throughout the war years, but to quote RADM Alfred M. Pride, Chief of the Navy's Bureau of Aeronautics in the early 50s, "It became evident . . . . that we were running out of horsepower in piston engines."

Calculations proved that a new attack aircraft, capable of operating unescorted against jet fighter opposition while still possessing a useful range and payload, would require an increase in

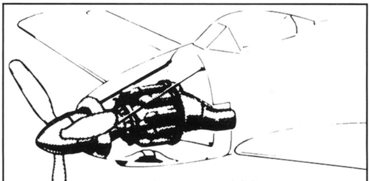
POWERPLANT STUDIES

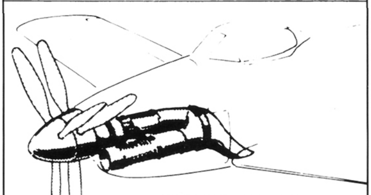
BELOW: G.E. TG-100 turbine engine installation was mounted in an AD Skyraider for flight testing, but was never flown as a flight engine was not delivered.

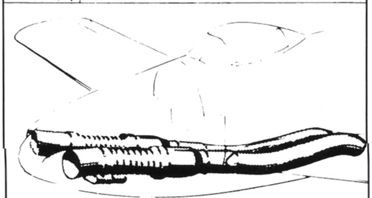
A composite jet and turbine engine was developed by Douglas but not built. This arrangement utilized two Westinghouse 24C jet engines arranged so that their exhaust would drive a turbine wheel, which in turn drove two opposite-rotating propellers.

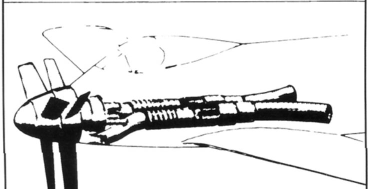
Twin jet proposal for two Westinghouse 24C jets did not meet takeoff and endurance requirements.

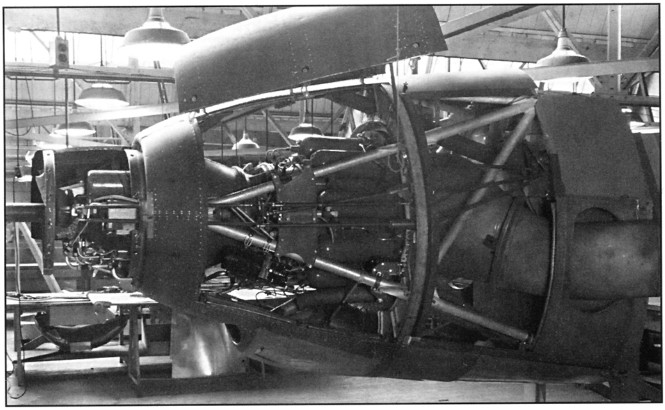
The double Allison T-40 engine driving a coaxial propeller through a reduction gear.


G.E. TG-100


COMPOSITE ENGINE


TWO WESTINGHOUSE 24C JETS


ALLISON T40 PROP JET



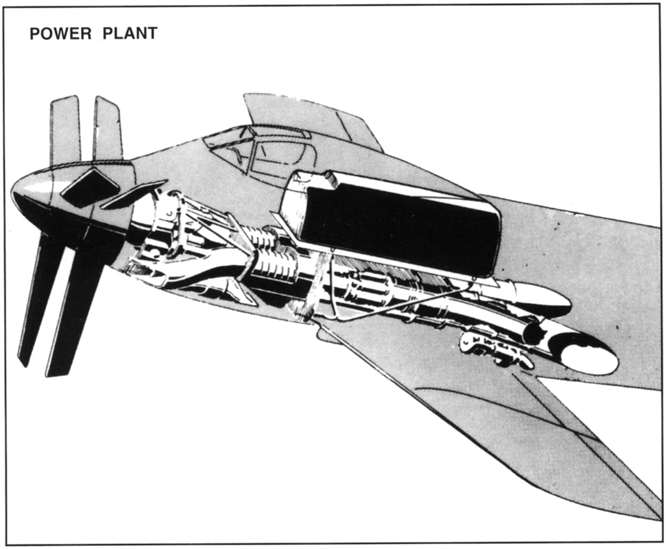
At left, General Electric TG-100 power section mockup around a non-flight engine. Further development was not continued as no flight capable engine was ever provided. The TG-100 engine assembly was to have been installed in a XBT2D-1 (AD-1) Skyraider. (MFR)

thrust approximately double that available from contemporary piston engines with no increase in aircraft weight. Turbo-compound developments of existing piston engines, such as the Wright Turbo-Cyclone version of the Skyraider's R-3350, could promise no more than a 15% to 20% increase in horsepower. Only the new gas turbine power-plants appeared to have the potential required. On 4 June 1945, the Chief of Naval Operations directed the Bureau of Aeronautics to develop a gas turbine powered attack plane.

The Navy intended that their new attack plane would probably utilize a turboprop rather than a pure jet. This was due to the special advantages that the Navy felt the turboprop could offer. As early as 1939, Navy planners predicted that the pure jet's usage aboard aircraft carriers would be limited by the relatively low static thrust of pure jet power. Early jets required speed and altitude to operate efficiently and were not particularly responsive to application of power at low speeds. It was felt that pure jets would have difficulty satisfying Navy carrier takeoff and landing requirements because of these constraints. Additionally, fuel consumption of the early jets was so high that the aircraft's range would limited. On the other hand, the turboprop combined the jet's speed with the flexibility of propeller operation. The turboprop provided a power output comparable to the pure jet with much better fuel consumption and the higher static thrust from the turboprop's propeller made it more responsive at lower speeds. This was desirable for landing, takeoff, and initial climb requirements of heavily loaded carrier-based aircraft. Navy thoughts on the matter were summed up by a Bureau of Aeronautics statement in 1945 that the "Propeller type gas turbine promises to be probably a more useful all-around power plant than the simple turbojet, at least for the majority of Naval aircraft applications."

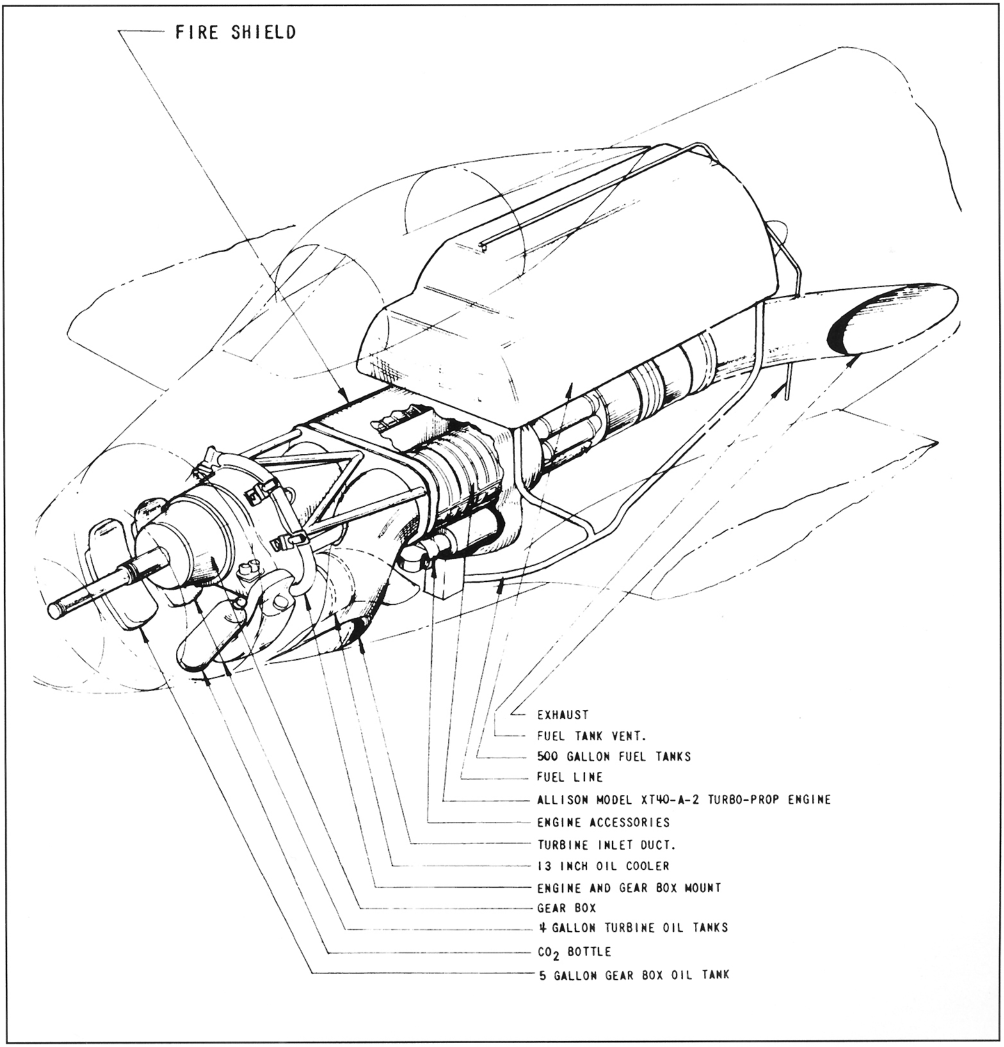
Problems involved in gearing the turbine to a propeller meant a longer development period for the turboprop and initially, the Navy concentrated on the development of the turbojet with the intention that the lessons learned could be applied to the turboprop.

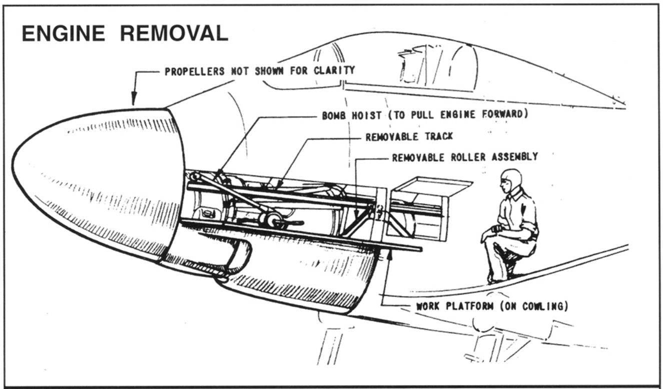
On 25 June 1945, the Bureau of Aeronautics issued a letter of intent to Contract 7203 to the Douglas Aircraft Co., Inc., for a series of design studies intended to define some of the problems involved in utilizing the tur-

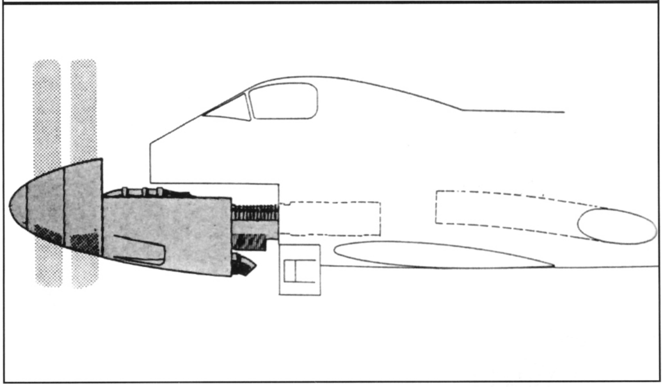


At left, the Allison T40 dual turbine engine was housed in the center of the fuselage under the pilot's cockpit and the 500 gallon fuselage fuel tank. The fuel was isolated from the engine by a fireproof bulkhead provided with overboard drains to prevent any possibility of fuel leaking onto the engine. The two power sections fed into one gear box, a dual rotation propeller. The oil systems supplied oil separately to the gear box and to each power unit. (MFR)

boprop in carrier aircraft designs. Three separate dive bomber torpedo designs, designated D-557A through D-557C, were considered, including design and construction of mockups and wind tunnel models. D-557A was a design utilizing two General Electric TG-100 gas turbines mounted in separate wing nacelles while D-557B was envisioned with two TG-100 gas turbines geared through a common gear box and shaft to counter-rotating propellers. D-557C consisted of a single Westinghouse 25D turbine driving counter-rotating propellers. Mockups were completed in April 1946 and the final reports were handed in by December of 1946. Douglas also proposed that they be allowed, as an item of allowable cost, to make a study of a design utilizing the new Allison turboprop then being developed. The proposal was rejected at the time, but more was to be heard from that combination. Douglas engineers and those of other manufacturers continued in the meantime to




ENGINE REMOVAL
PROPELLERS NOT SHOWN FOR CLARITY
BOMB HOIST (TO PULL ENGINE FORWARD)
REMOVABLE TRACK
REMOVABLE ROLLER ASSEMBLY
WORK PLATFORM (ON COWLING)



At left, engine removal was simplified by the addition of rails on which the entire powerplant, including propeller, could be moved forward sufficiently to attach hoisting equipment. (MFR)

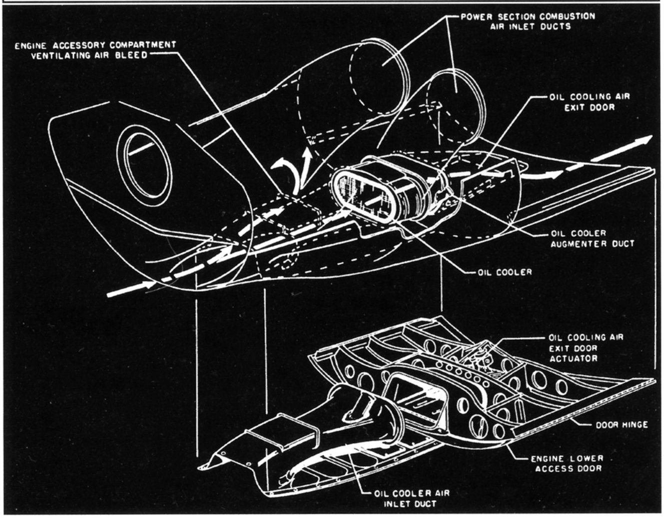
study various airframe/powerplant combinations that would help to point the way towards a successful marriage of the propeller with the gas turbine. For instance, Douglas engineers conceived a design in October, 1945, the XBT3D-1 with an unspecified turboprop powerplant, that bore a very close resemblance to the later A2D design.

THE POWERPLANT

The Allison turboprop and its Aeroproducts propeller, being jointly developed under Bureau of Aeronautics sponsorship, was one of several turboprop designs initiated by the Navy in the latter part of WWII,. An earlier contract, to Northrop in 1941, eventually resulted in the XT-3 Turbine; but the start of WWII temporarily diverted development work on new projects while attention was concentrated on producing existing designs.

By 1943, the Navy was again interested in getting design studies underway on geared gas turbine engines. Proposals were received and contracts were let to a number of manufacturers including Chrysler Corp., Westinghouse, Pratt & Whitney, and the Allison Division of General Motors Corp. Allison's proposal was in response to a BuAer request for a turboprop suitable for operations at medium (below 20,000 ft.) altitudes and a goal of 4,100 HP. It was a big order and much original design thinking preceded the Allison proposal for a layout utilizing twin axial-flow turbine units, mounted in parallel, and driving a common reduction gearbox. Allison's proposal was submitted in November, 1944, and a

POWER SECTION AIR INDUCTION AND COOLING SYSTEMS

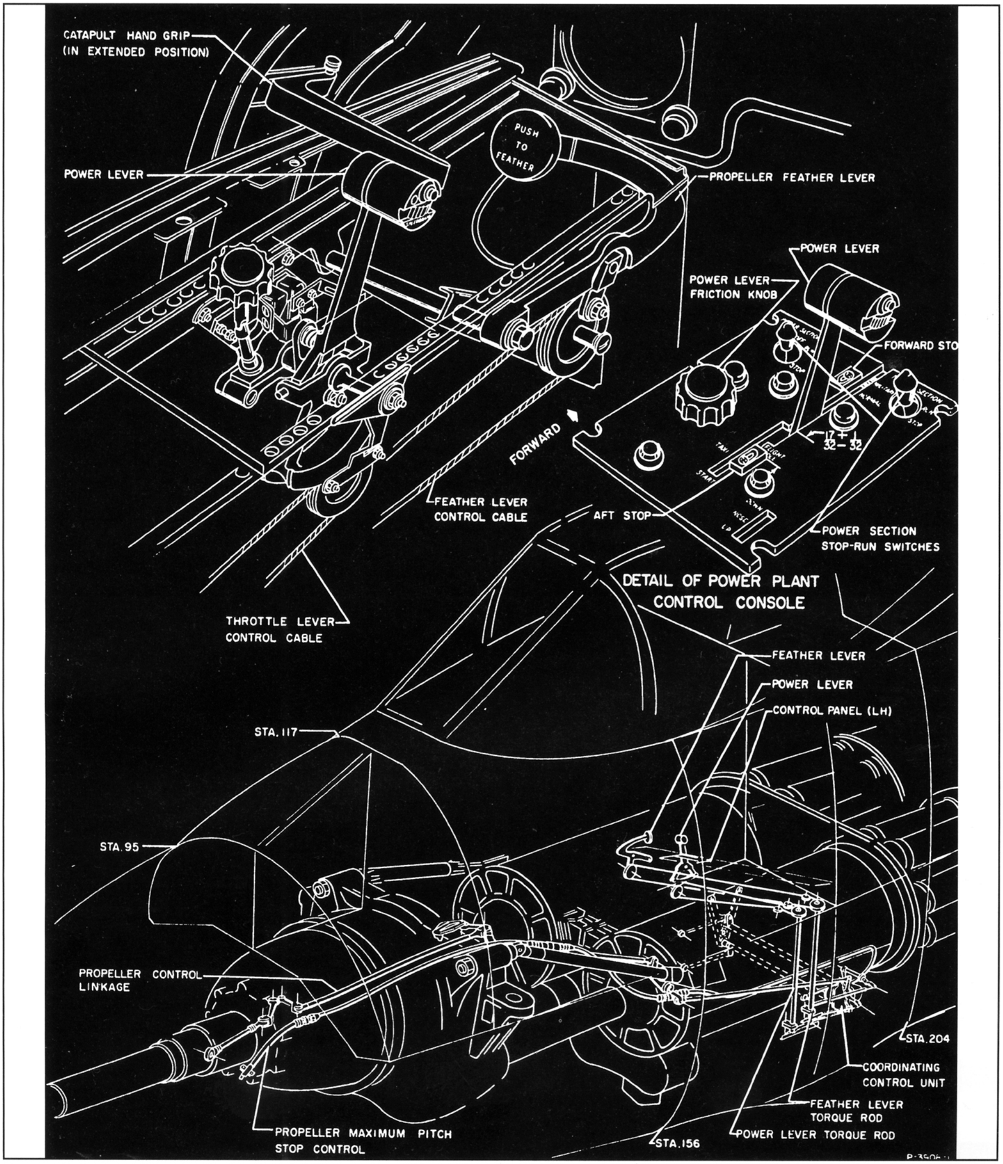

POWER SECTION COMBUSTION AIR INLET DUCTS
ENGINE ACCESSORY COMPARTMENT VENTILATING AIR BLEED
OIL COOLING AIR EXIT DOOR
OIL COOLER AUGMENTER DUCT
OIL COOLER
OIL COOLING AIR EXIT DOOR ACTUATOR
DOOR HINGE
ENGINE LOWER ACCESS DOOR
OIL COOLER AIR INLET DUCT

At left, the forward lower fuselage was an integral part of the powerplant section and contained the engines' air intake and oil cooler air inlet duct. (National Archives)

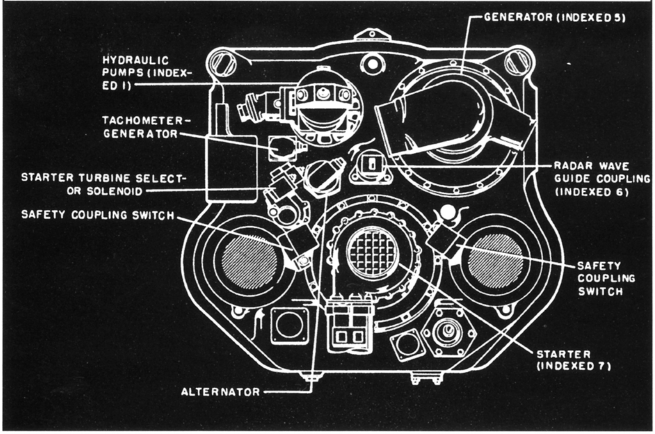
POWERPLANT CONTROLS INSTALLATION

Navy design contract was awarded in December, 1945, to develop the powerplant which received the designation XT40-A.

Allison had begun turboprop design studies in 1944 after the company had made an extensive comparison of the relative merits of the compound reciprocating engine versus the turboprop. A compound version of the Allison V-1710 liquid cooled reciprocating engine was built, but the pro-

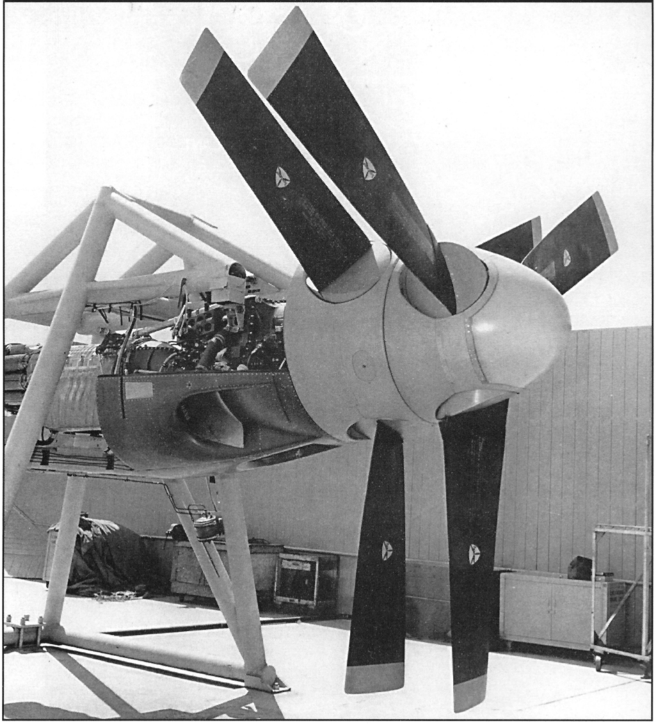

CATAPULT HAND GRIP (IN EXTENDED POSITION)
PUSH TO FEATHER
POWER LEVER
PROPELLER FEATHER LEVER
POWER LEVER
POWER LEVER FRICTION KNOB
FORWARD STO
FORWARD
TAXI
FLIGHT
START
17/32
1/32
FEATHER LEVER CONTROL CABLE
AFT STOP
POWER SECTION STOP-RUN SWITCHES
THROTTLE LEVER CONTROL CABLE
DETAIL OF POWER PLANT CONTROL CONSOLE
FEATHER LEVER
POWER LEVER
CONTROL PANEL (LH)
STA. 117
STA. 95
PROPELLER CONTROL LINKAGE
STA. 204
COORDINATING CONTROL UNIT
FEATHER LEVER TORQUE ROD
POWER LEVER TORQUE ROD
STA. 156
PROPELLER MAXIMUM PITCH STOP CONTROL

ACCESSORIES MOUNTING AFT FACE OF GEAR BOX



Below and at right bottom, the complete one-piece powerplant as would be removed from the A2D, complete with forward lower fuselage and engine intake and oil cooling ducting, installed on an engine test stand. (National Archives)

COMPLETE POWERPLANT MOUNTED ON TEST STAND

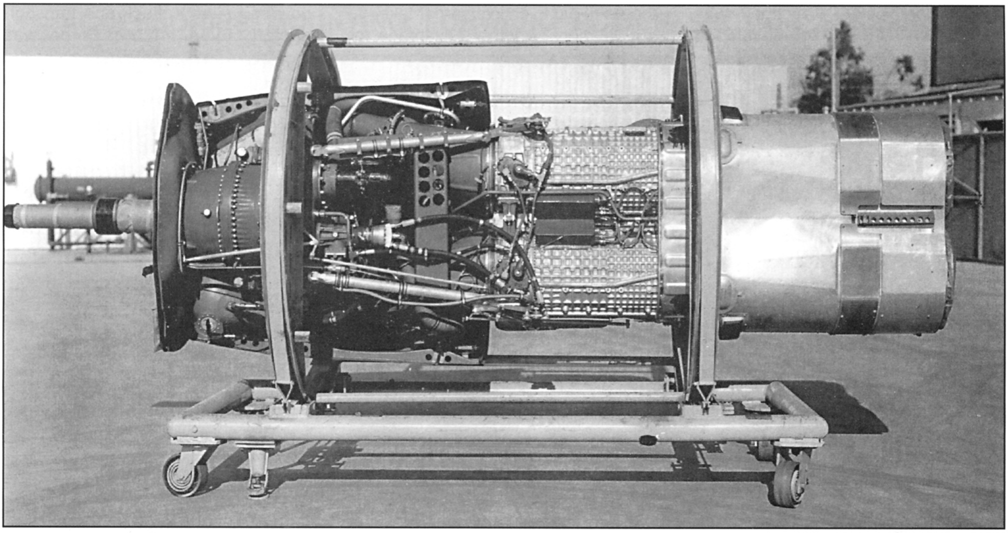


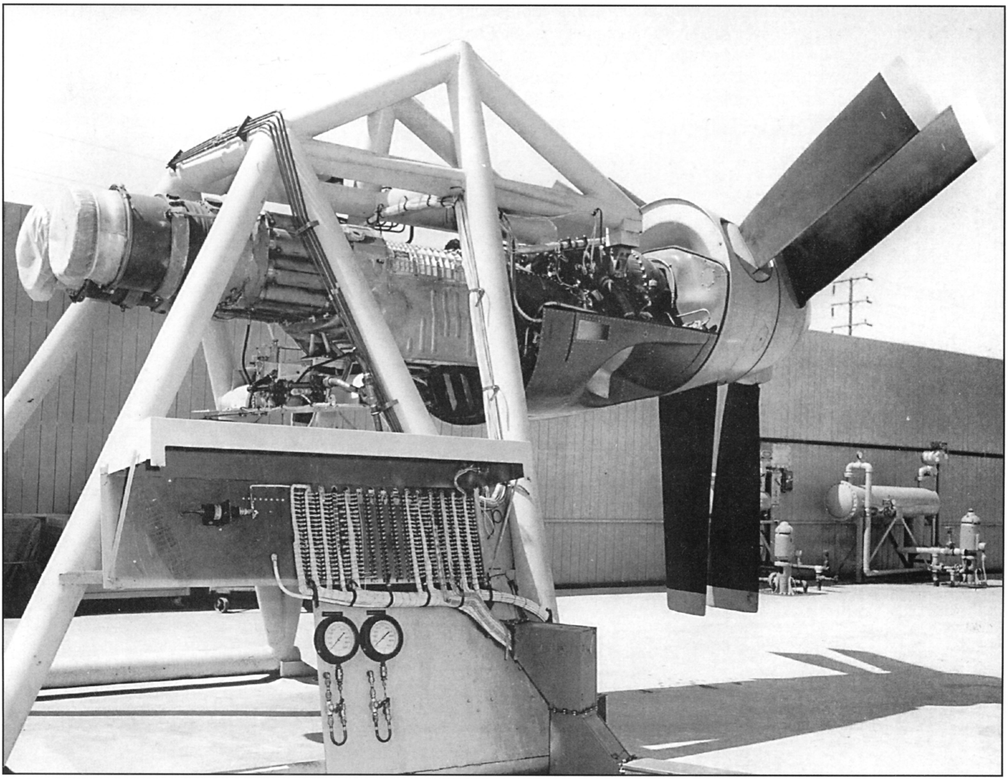
At right, top view of YT40-A-6A on an engine construction jig at Douglas. (National Archives)

ject was abandoned when Allison decided that the turboprop offered better long-term potential. The XT40-A was Allison's first attempt at a basic gas turbine design and the unique layout was a reflection of some of Allison's previous powerplant design experience that included the long shafts and remote reduction gearing utilized for the V-1710 installation in the Bell P-39 and P-63. Allison gained additional experience while developing and producing the J-33 centrifugal flow turbojet, based on British designs, and the J-35 axial flow turbojet, based on German designs, that assisted them during the development of their own gas turbine. The axial flow turbine sections of the XT40-A were in line with the Navy's philosophy of developing axial flow turbojets which promised higher power output and more compact installations than centrifugal flow turbojets.

Design and construction of the XT-40-A and its Aeroproducts AD8664 FN-47 counter-rotating propeller proceeded throughout the early postwar years, and the first power section (XT38A) ran on a test stand in January, 1948, followed by the complete XT40-A-1 in June, 1948. An XT38A flew experimentally in the nose of a B-17 in early 1949.

Allison's XT40-A-1 when completed consisted of two Model 501 (XT38-A) axial type gas turbine power sections mounted side-by-side and connected to a common 15.57:1 reduction gearbox by extension shafts. The gearbox drove co-axial propeller shafts turning a pair of three-bladed, 14 ft. diameter, counter-rotating, Aeroproducts propellers and featured de-coupling and re-coupling spring-loaded clutches for each power section. Both propellers featured full feathering, reversing, and braking. The two power sections drove both propellers simultaneously and each power section could drive both propellers independently when





the other power section was declutched. An Allison-developed electro-mechanical throttle control system co-ordinated engine and propeller speeds through a single throttle control in the cockpit. Automatic starting, clutching, and ignition were provided by the system. The XT40-A-2 which would eventually power the prototype Skyshark developed military and takeoff power of 5,100 eshp. and 830 lbs. of residual thrust at 13,620 rpm.

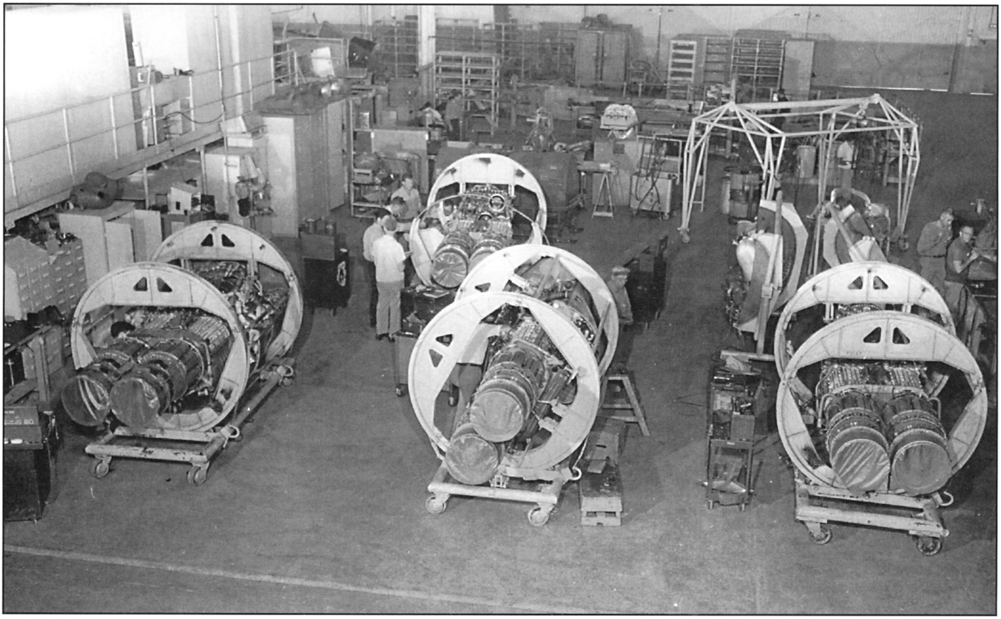
The dual engine layout of the XT40-A offered high horsepower by the expedient of coupling the two smaller turbine engines together. In addition to high horsepower, the layout promised as much as 20% greater range than comparable single unit turboprops. Economical cruise power at medium and low altitudes could be obtained by cutting out one power section and allowing the operating power section to run at its most efficient point. The single power section would drive both propellers which precluded drag from a feathered propeller. The counter-rotating propellers provided high static thrust with no torque to aid in critical carrier takeoffs and landings. Another advantage for carrier operations was the procedure of operating the turbine power sections at or near full power and varying the propeller pitch for different thrust requirements. This reduced the problem of poor throttle response common to early jet engines, which would have been a severe problem aboard carriers.

Both Allison model 501 power sections were identical, though Allison engineers had originally preferred a 60:40 power ratio for the two power sections. A 60:40 power ratio was preferred for maximum operational efficiency, but the 50:50 ratio was eventually chosen in the interest of cost reduction and commonality.

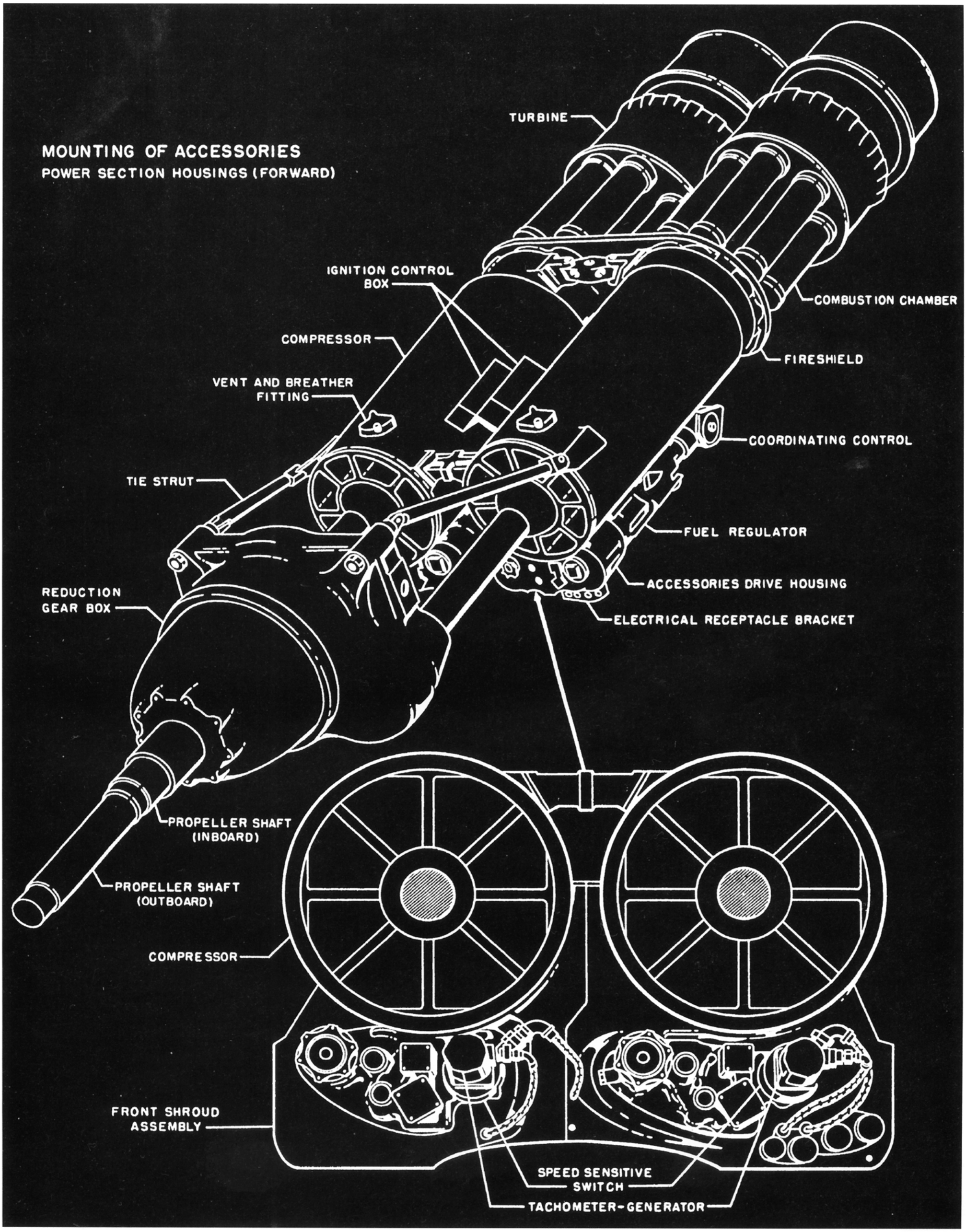
Development of the XT40-A, XT38-A, Pratt & Whitney's XT34, and other Navy sponsored turboprop powerplants represented a Navy triumph over the Air Force, which had concentrated on pure jet development at the expense of the turboprop. The Navy planned a new generation of turboprop aircraft including T40 powered patrol, attack and transport aircraft. Even the Air Force was caught up in the enthusiasm for the turboprop, and turboprop installations using Navy sponsored engines were designed and flown in a variety of Air Force aircraft.

The dual engine layout of the XT40-A had been advocated at an early date by CAPT Seldon B. Spangler, Director of the Power Plant Division at BuAer and his Deputy, CDR Emerson W. Fawkes. These officers, along with RDAM Lloyd Harrison, Head of Naval Aviation Procurement, and CAPT Walter Diehl, serving under Rear Admirals Harold B. Sallada and Alfred M. Pride, succeeding BuAer Chiefs, pursued a vigorous program to develop the turboprop as well as the pure jet in spite of the Air Force's decision to abandon propellers and concentrate on the pure jet.

Below, four A2D-1 XT-40 power sections during final assembly at Douglas on 9-21-53. (National Archives)

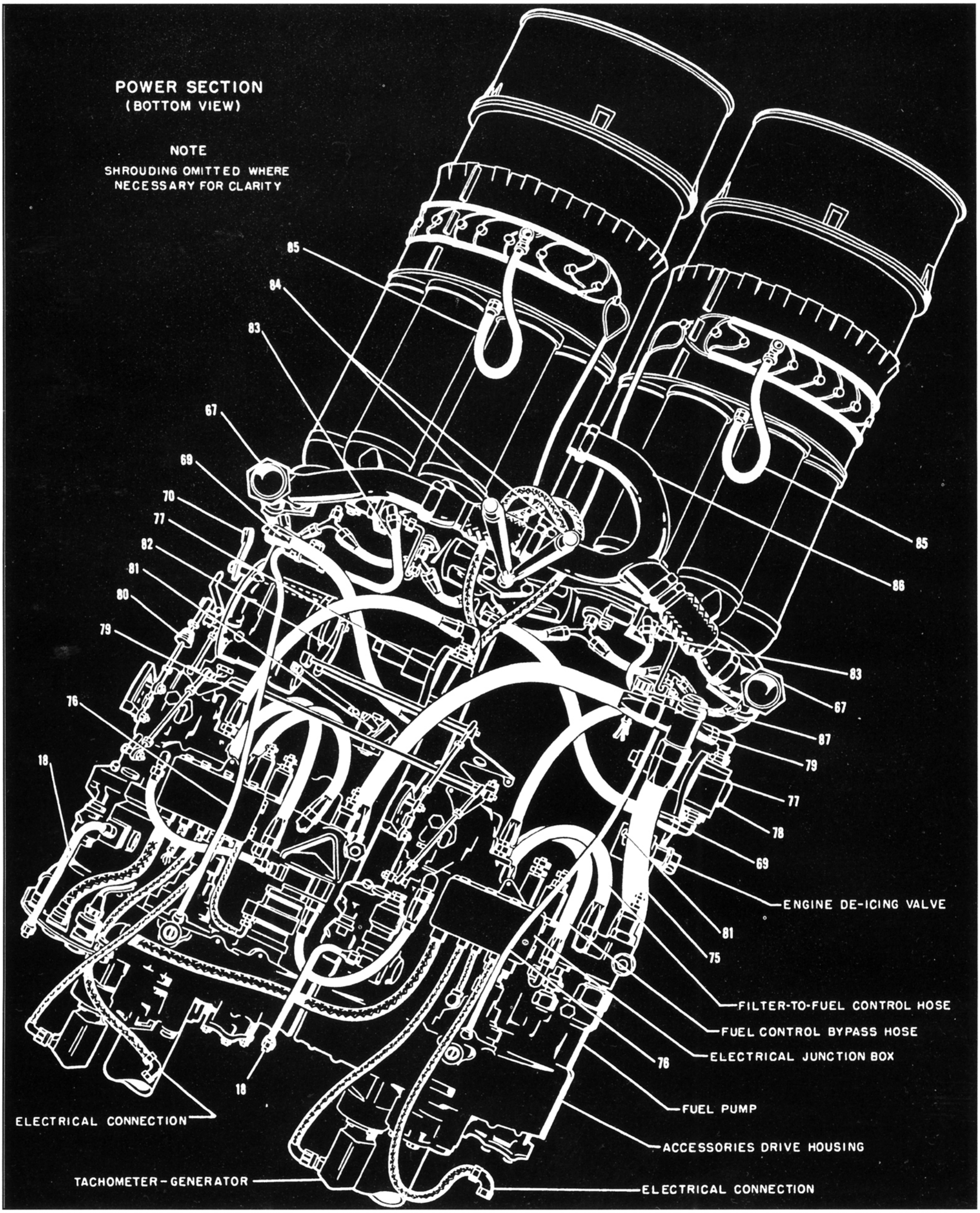


ACCESSORIES MOUNTING FORWARD POWER SECTION HOUSINGS



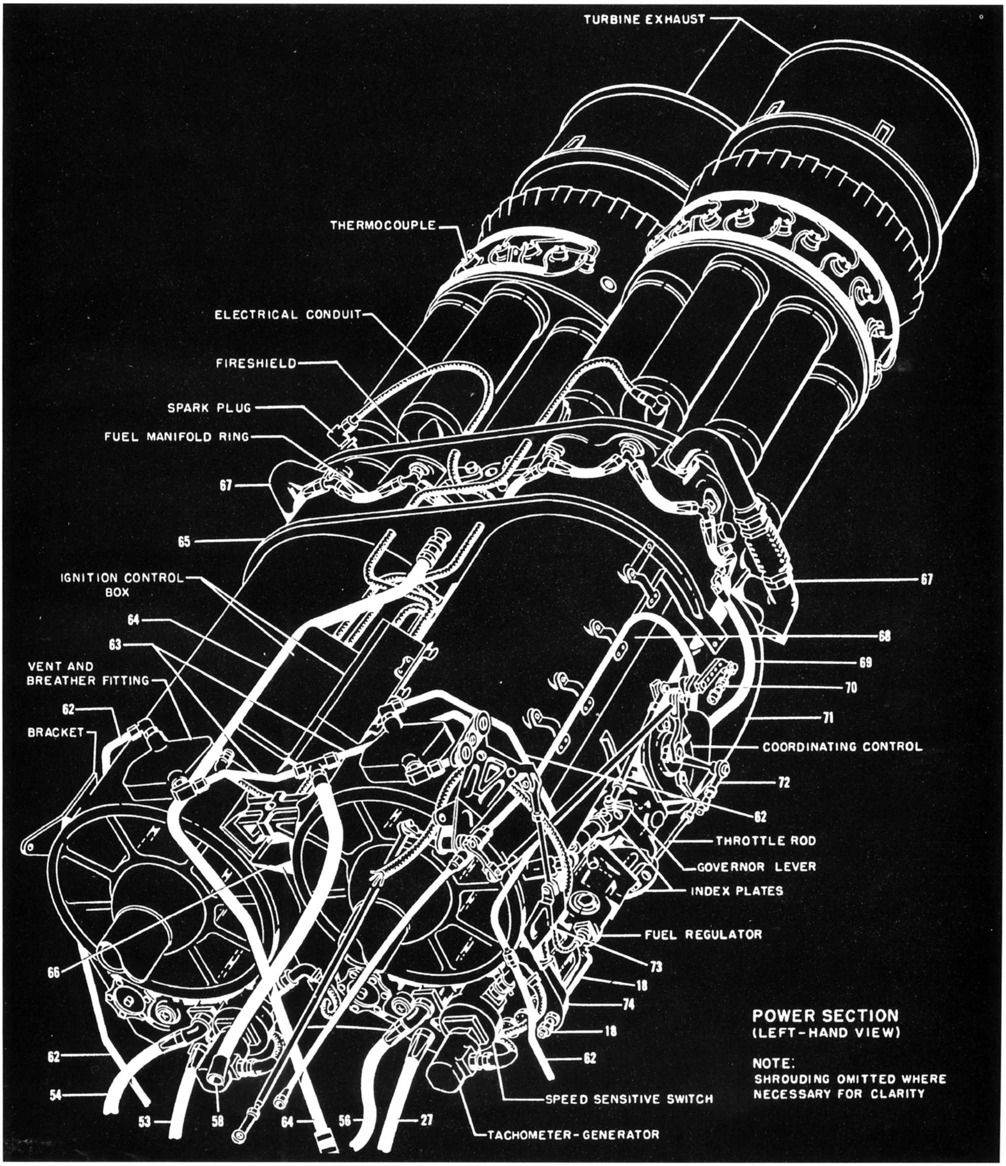
ENGINE POWER SECTIONS BOTTOM VIEW

18.) LH Fuel Regulator Drain Line
27.) Oil Supply Hose LH power section
53.) Oil Supply Hose RH power section
54.) Oil Return Hose RH power section
56.) Oil Return Hose LH power section
58.) Oil Vent Hose
62.) Power Section Breather Line Reducer
63.) Power Section Vent Line
64.) Accessory Air Supply Line
65.) Aft Compressor Shroud
66.) Center Shroud Assembly
67.) Accessory Air Supply Duct
68.) Compressor Shroud
69.) Fuel Manifold Supply Hose
70.) Outside Feathering Lever Arm
71.) Compressor Aft Lower Shroud
72.) Throttle Rod End (disconnect)



ENGINE POWER SECTIONS LEFT HAND VIEW

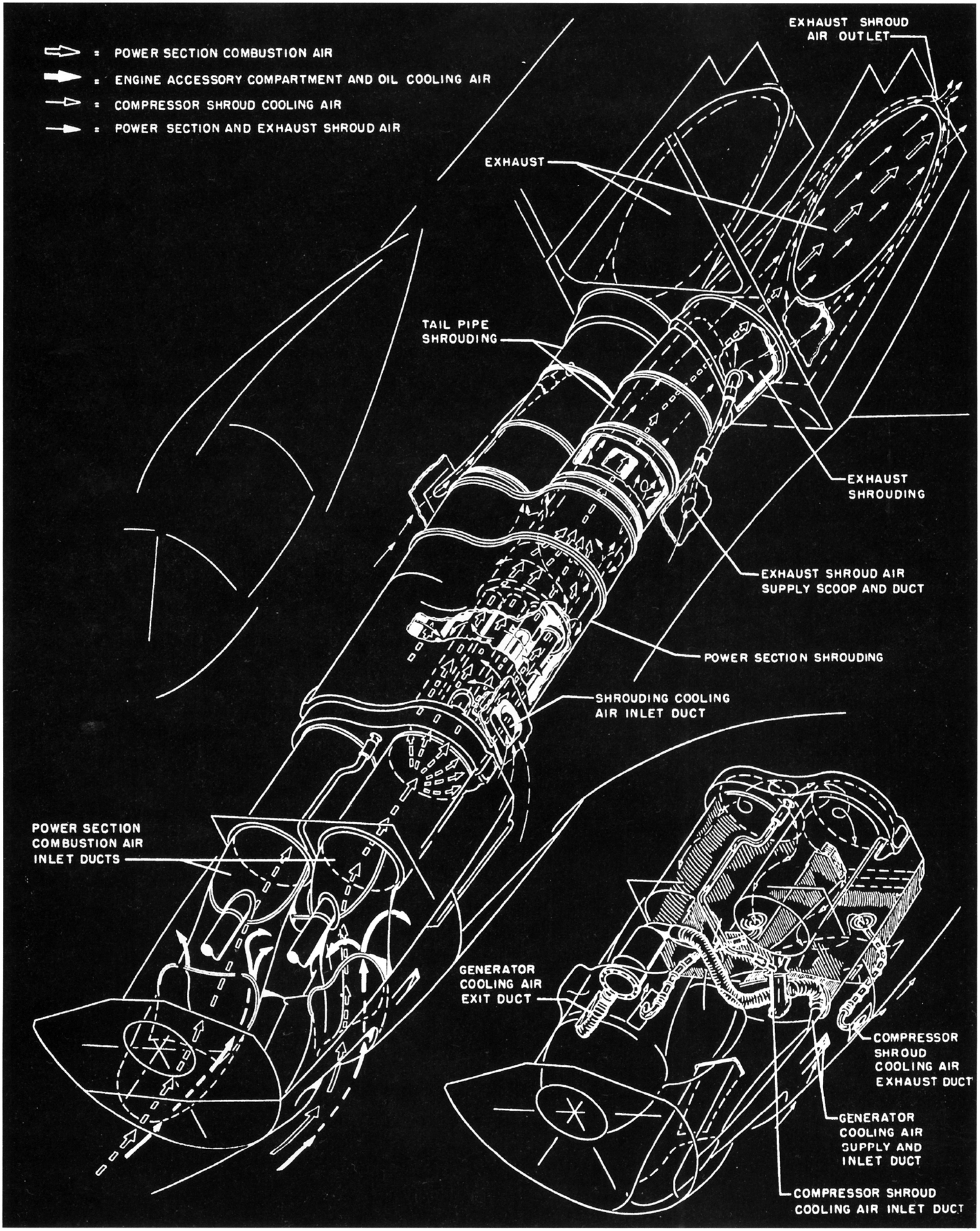
73.) Roller Assembly
74.) Compressor Front Shroud
75.) Fuel Supply Hose
76.) Fuel Drain Line
77.) Fuel Flowmeter Bracket
78.) Fuel Flowmeter Transmitter
79.) Fuel-Regulator-To-Flow meter Hose
80.) Control Rod Seal
81.) Fire Director Unit
82.) Inner Feathering Lever Arm controls
83.) Fuel Drip Valve Drain Line
84.) Aft Engine Mount
85.) Burner Fuel Drain Valve
86.) Air Conditioning Manifold



POWER SECTION
(LEFT-HAND VIEW)

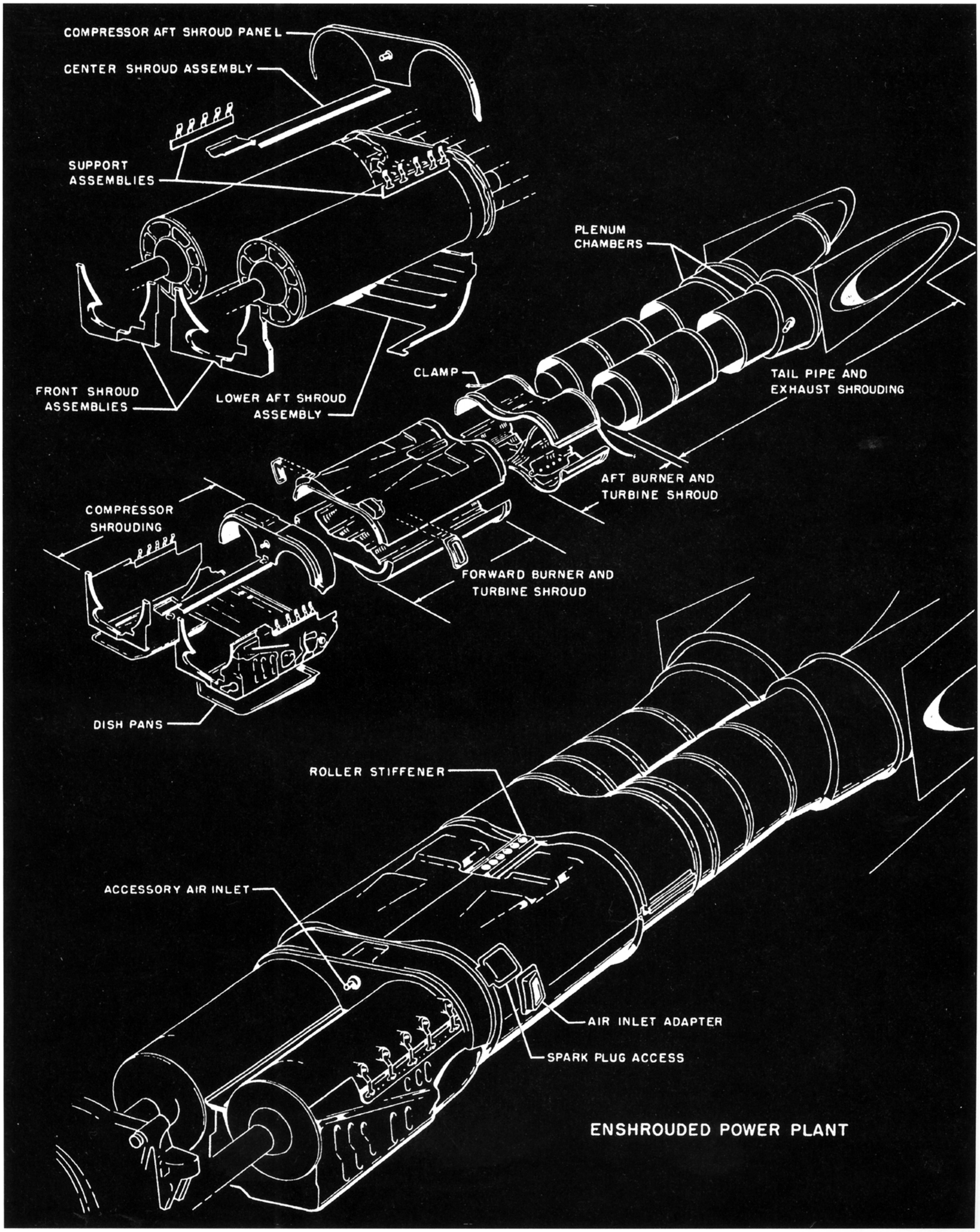
NOTE:
SHROUDING OMITTED WHERE
NECESSARY FOR CLARITY

AIR INDUCTION, COOLING AND EXHAUST SYSTEMS



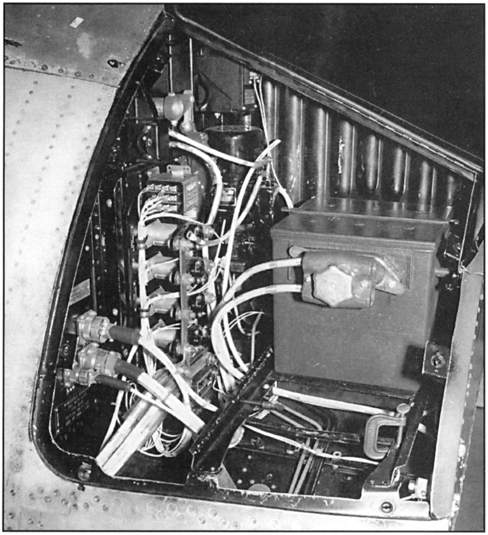
⇨ = POWER SECTION COMBUSTION AIR
➡ = ENGINE ACCESSORY COMPARTMENT AND OIL COOLING AIR
→ = COMPRESSOR SHROUD COOLING AIR
→ = POWER SECTION AND EXHAUST SHROUD AIR
EXHAUST SHROUD AIR OUTLET
EXHAUST
TAIL PIPE SHROUDING
EXHAUST SHROUDING
EXHAUST SHROUD AIR SUPPLY SCOOP AND DUCT
POWER SECTION SHROUDING
SHROUDING COOLING AIR INLET DUCT
POWER SECTION COMBUSTION AIR INLET DUCTS
GENERATOR COOLING AIR EXIT DUCT
COMPRESSOR SHROUD COOLING AIR EXHAUST DUCT
GENERATOR COOLING AIR SUPPLY AND INLET DUCT
COMPRESSOR SHROUD COOLING AIR INLET DUCT

POWERPLANT SHROUDING INSTALLATION

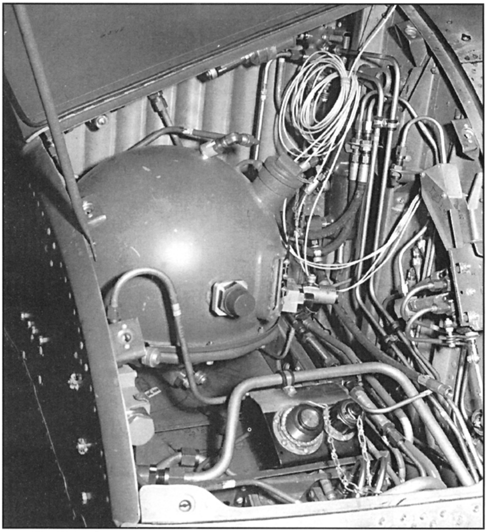


ENSHROUDED POWER PLANT

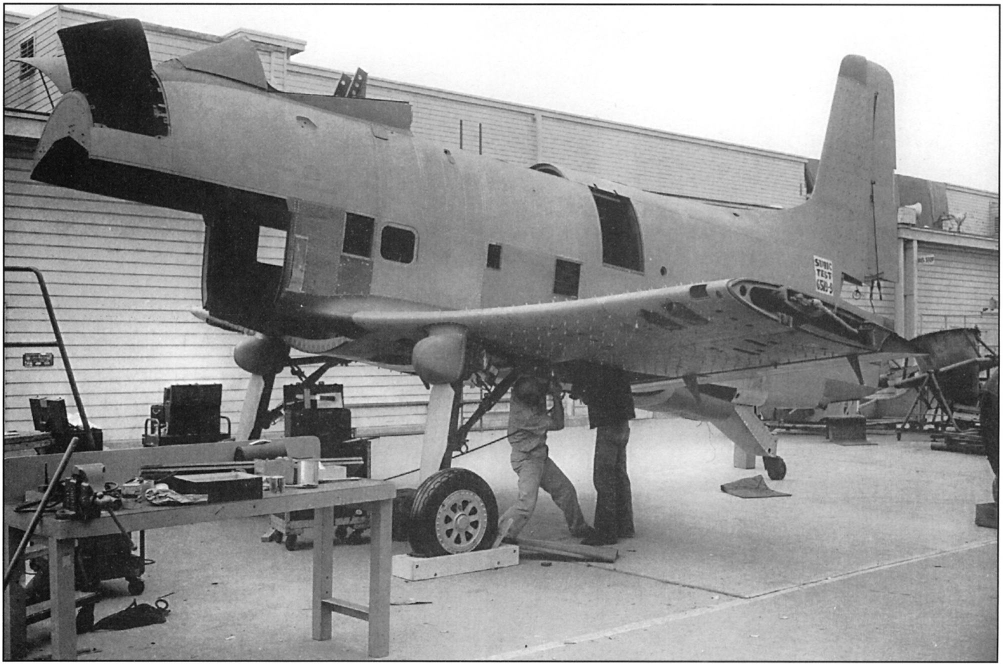
FORWARD ELECTRICAL COMPARTMENT



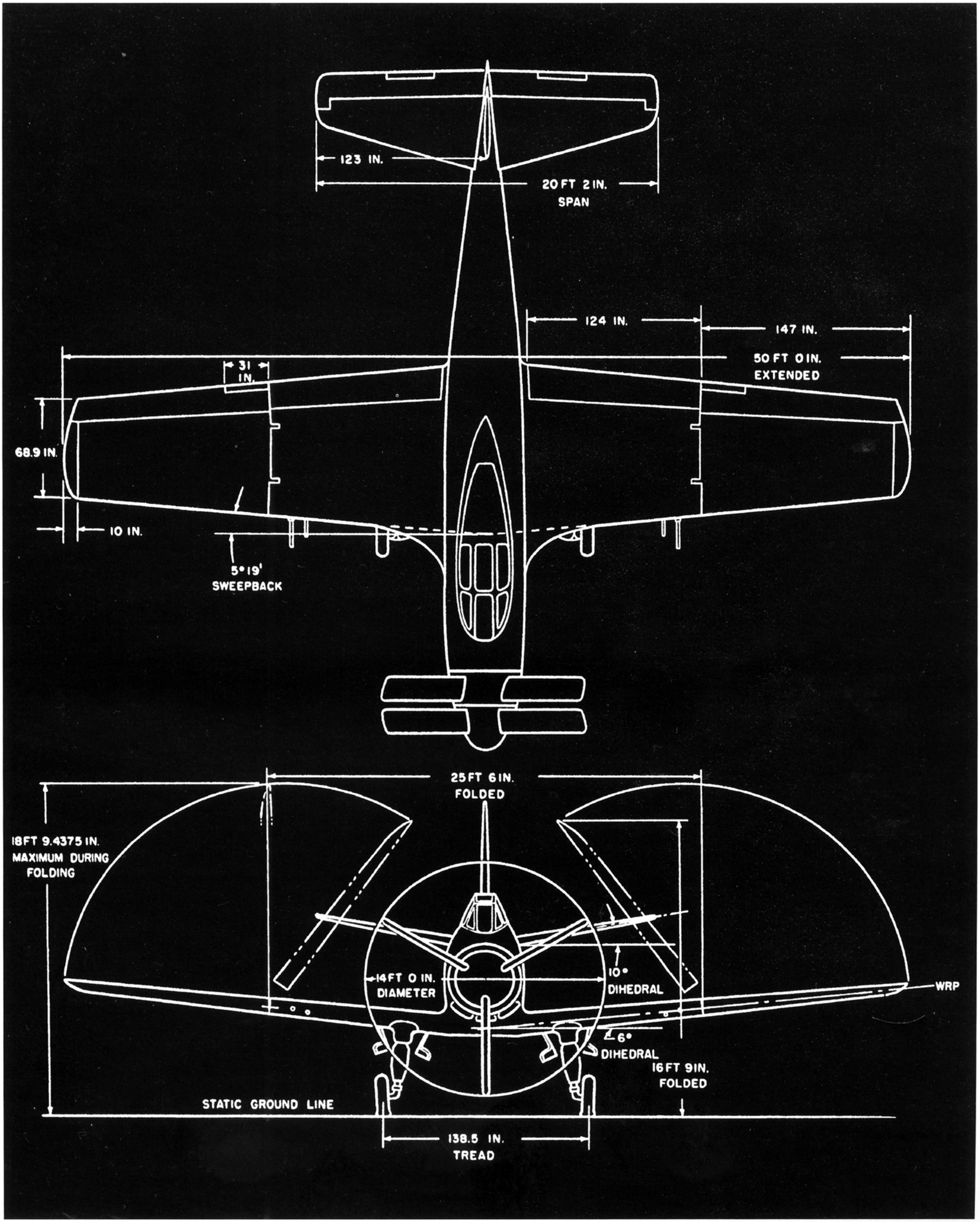
FORWARD HYDRAULIC COMPARTMENT

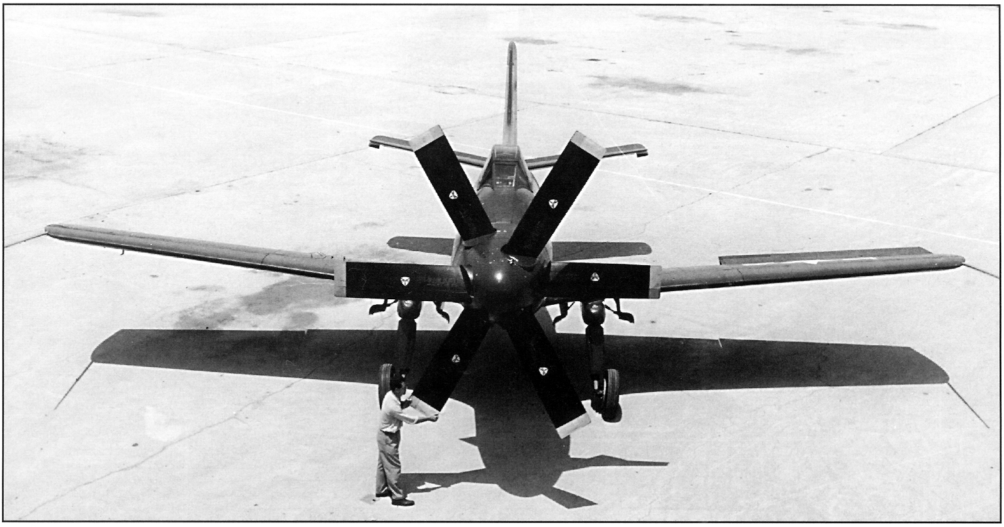


Above, forward electrical and hydraulic compartments of production A2D-1 BuNo. 125480 on 12-22-52. The compartments were located to the left and right of the pilot's windscreen as shown below on the static test airframe. (National Archives)



A2D SKYSHARK PRINCIPAL DIMENSIONS





Above, the first Skyshark XA2D-1 BuNo. 122988 at the Douglas plant on 5-11-50. (via Gerry Markgraf)

THE AIRCRAFT

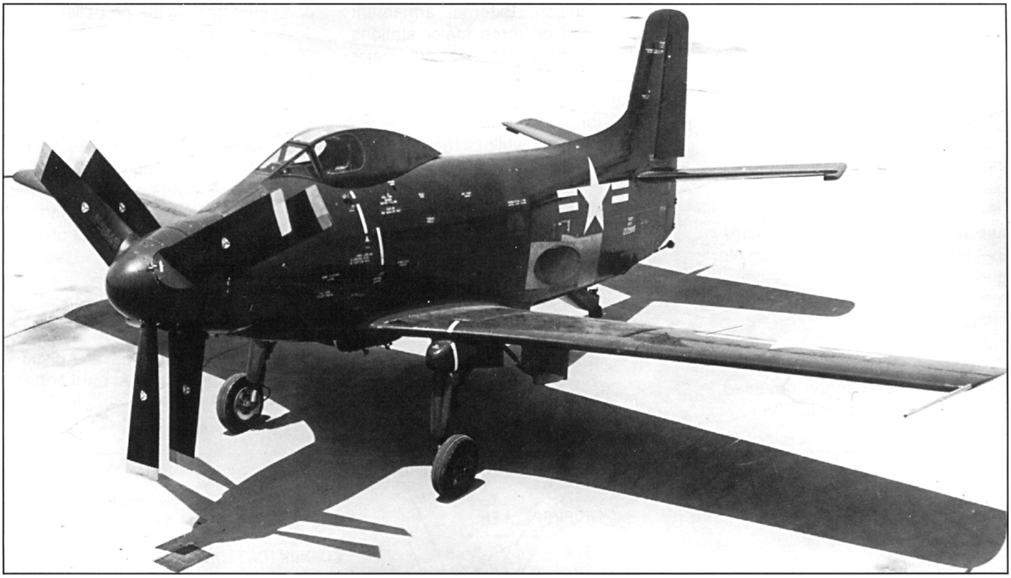
Progress on the new turboprops was encouraging and, on 21 April 1947, the Chief of Naval Operations restated the requirements for a new attack aircraft. The new aircraft would have the ability to defend itself against jet fighters, with suitable armament for air-to-air attack, the capability for sustained attack on ground or surface targets, capability of operating from CVE-55 class escort carriers, if possible, and a combat radius of 600 miles with a reduced bomb load.

Proposals from various aircraft manufacturers were considered and a design prepared by Ed Heinemann and his engineering staff at Douglas Aircraft's El Segundo Division, similar in some respects to the earlier D-557B study and powered by the Allison XT40-A-2 turboprop, was judged superior. Douglas Aircraft received a letter of intent to Contract 9021 on 11 June 1947 for the preparation of preliminary layouts, stress analysis, aerodynamic analysis, wind tunnel models, and mockups in sufficient detail to permit evaluation of the new attack aircraft. An original intent, and an attractive one to the Navy in the low-budget years following WWII, was to utilize as many AD Skyraider components as possible and the new aircraft received an early designation of AD-3 to reflect this. However, with the selection of the XT40-A-2, increasing strength, stability, and equipment requirements soon affected so much of the airframe that only a family resemblance to the Skyraider remained. These changes resulted in the aircraft being redesignated XA2D-1 to give it the status of a completely new design and the AD-3 designation reverted to a Skyraider version.

By the time of the XA2D-1 Mockup Conference on 15-19 September 1947, the XA2D-1 had evolved into what was essentially its final configuration.

Arrangement of the Skyshark was conventional, with an all-metal semi-monocoque structure and a two-spar wing. The wing planform and tail arrangement of the AD remained, but the thickness/chord ratio of the XA2D-1 had been thinned down to about 12% to allow for the higher speeds possible with the new powerplant. The AD landing gear was retained, although the strength and stroke were increased, and the landing gear track was decreased from the Skyraider's 14 ft. to 12 ft. to allow for stowage in the thinner wing. A single speed brake with 17 sq.ft. of area was mounted under the fuselage behind the wing to improve maneuverability during combat and increased angle of descent. Wind tunnel tests had revealed marginal longitudinal stability in low speed flight on the original design and this was corrected by shifting the wing aft and adding dihedral to the horizontal stabilizer.

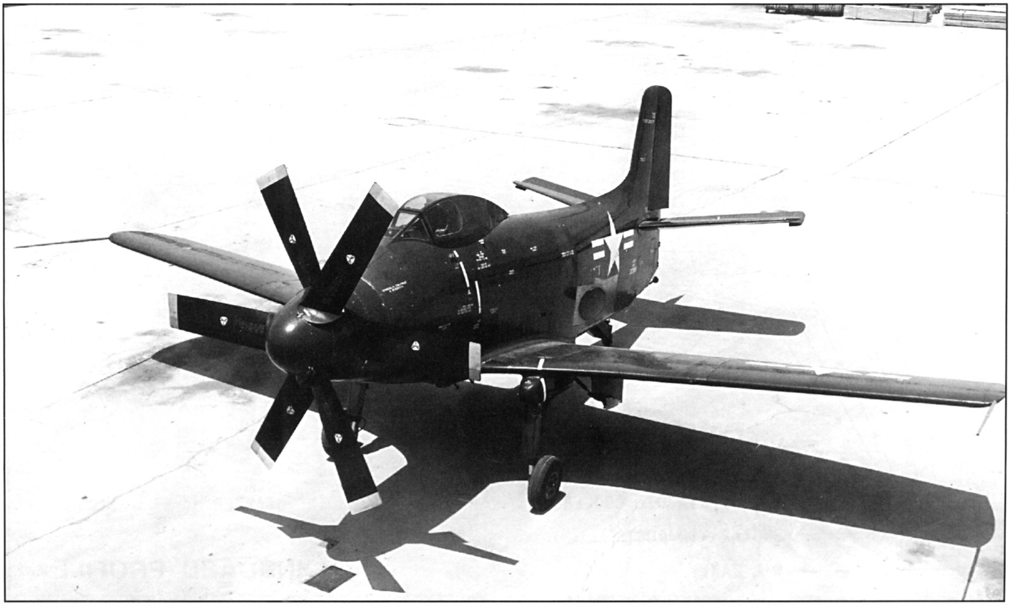
The Allison XT40-A-2 dual turbine engine was housed in the center of the fuselage just under the pilot's cockpit and the aircraft's 500 gallon fuel tank. Air intakes for the engines were located under the nose behind the propellers and two large exhaust ducts exited on either side of the fuselage just aft of the wings. Engine removal was simplified by the addition of rails on which the entire power



plant, including the propellers, could be moved forward sufficiently to attach a hoist.

The cockpit was moved forward from that of the AD to improve pilot vision, strengthened to improve crash resistance, and a powder cartridge operated upward ejection seat was provided; although Douglas engi-

Above and below, XA2D-1 122988 viewed from the right-front with prop blades posed in trail and opposing. Note the original short vertical tail. (via Wayne Morris)



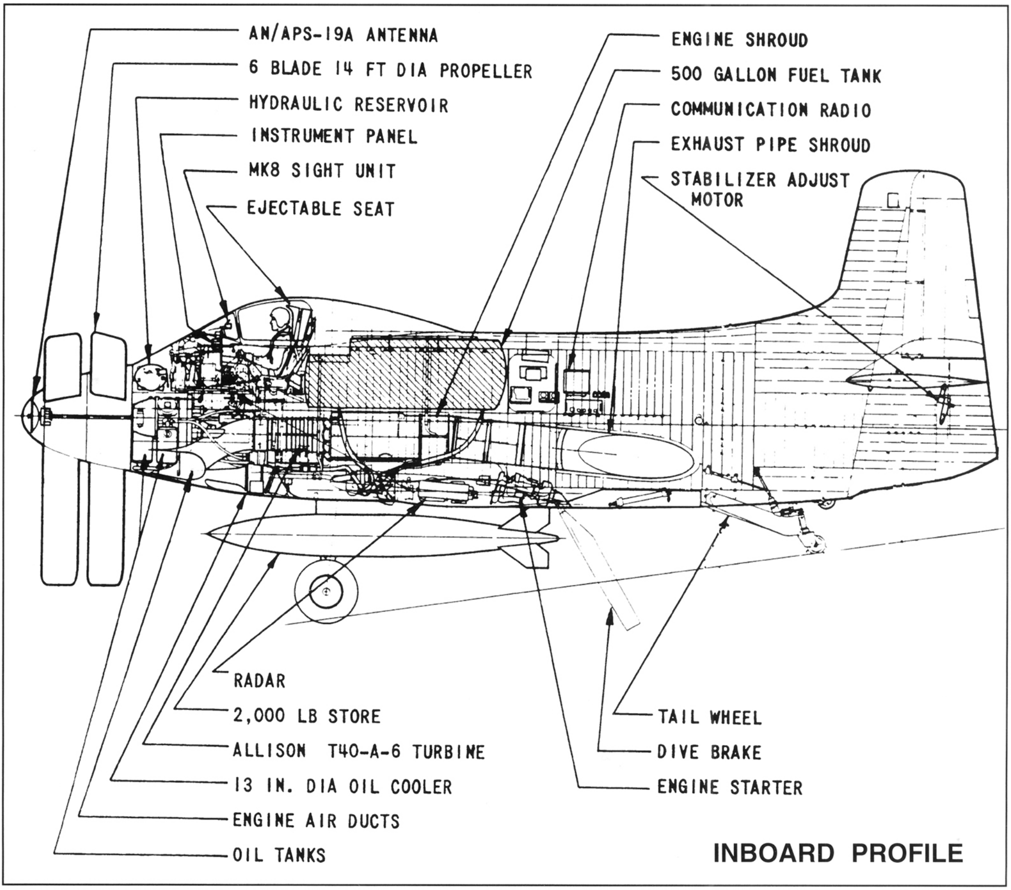
neers indicated they probably would have preferred to use the lightweight, downward, gravity-drop, bail-out chute used in the F3D Skyknight. The position of the engine directly beneath the cockpit precluded use of the bail-out chute. A metal hood utilizing single curvature laminated plate glass replaced the full blown canopy used on the Skyraider. Double curvature plate glass was not available at that time and glass, rather than plexiglas, was considered necessary to meet hot day, sea level, full throttle speed requirements.

Internal armament consisted of four 20mm T31 cannon mounted in the wings, each gun with 200 rounds of ammunition. External armament was carried on three major stations and eight minor stations. Each major station was capable of carrying a variety of loads including one 2,000 lb. bomb, torpedo, rocket, or a 300 gallon drop tank; while minor stations could carry a single 5 inch HVAR rocket or similar store. Production models of the A2D would have provisions for as many as 22 minor stations under the wing in addition to three major stations.

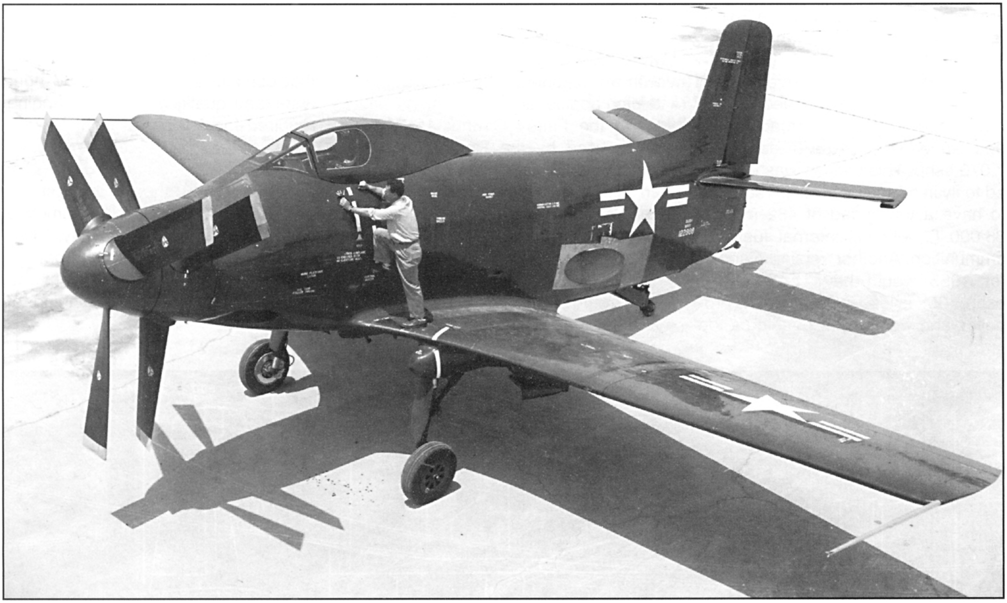
Provision was made for installation of an AN/APS-19A radar installation, with the scanner inside the fibreglass propeller spinner/radome. The radar provided for coverage of a 120° cone centered on the propeller.

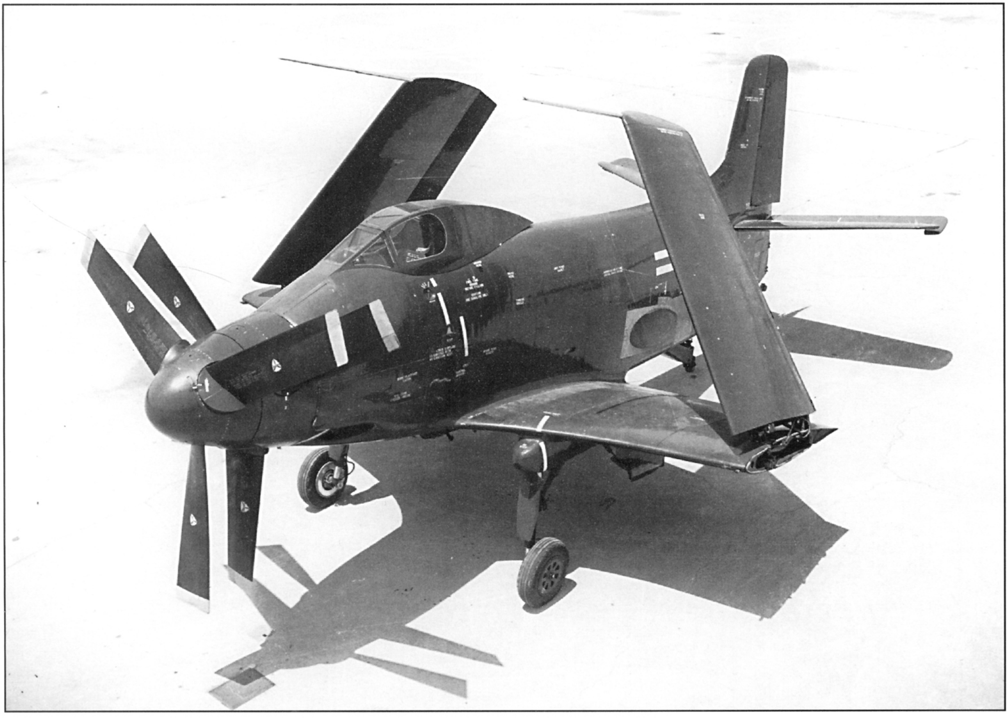
The design was judged satisfactory following the Mockup Conference and Douglas received, on 25 September 1947, a letter of intent to Contract 9351 calling for XA2D-1 aircraft, design data, and flight demonstration. First flights of two prototypes (BuAer 122988-989) were scheduled (in 1948) for March and June of 1949 respectively. The contract described the aircraft as having a high speed of 438 knots at 30,000 ft., a service ceil-

At right top, Douglas engineer demonstrates cockpit egress. At right bottom, wings-folded comparison. (via Wayne Morris)



INBOARD PROFILE

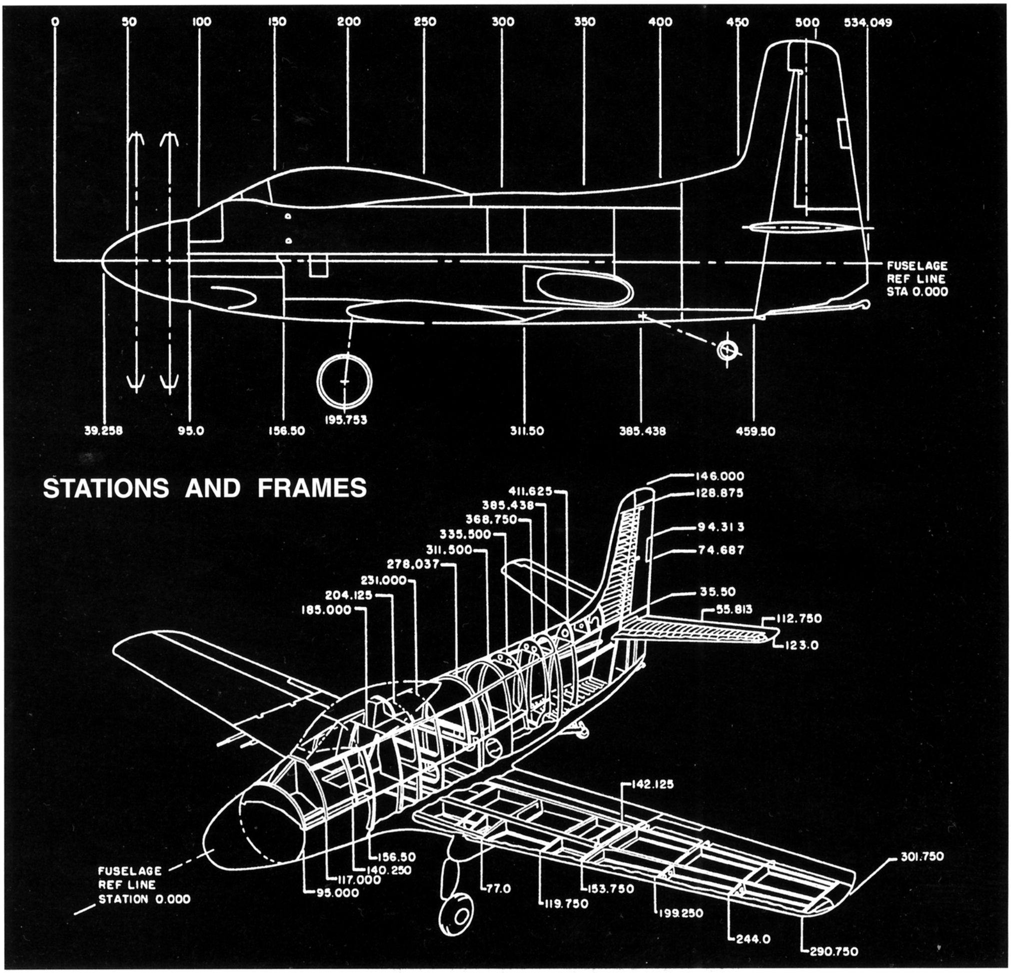




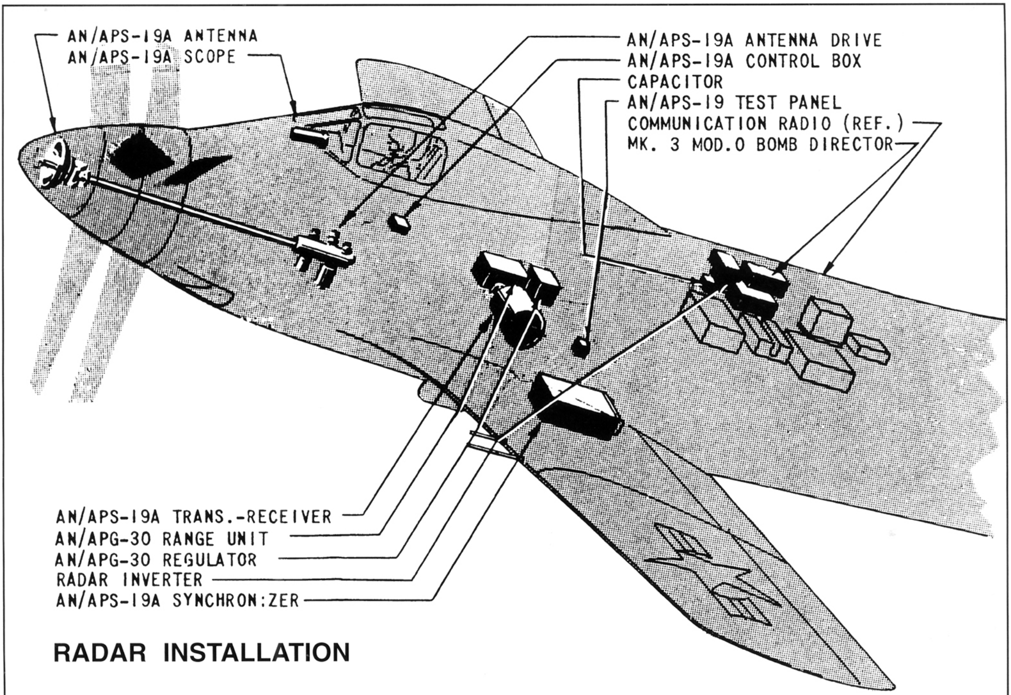
ing of 50,250 ft., and having a 231 ft. take-off run in a 25 knot wind.

Future Skyshark development plans included a higher speed version envisioned with 35° sweptback wings and an Allison T40-A-8 delivering 7,070 eshp. This version was expected to fly in prototype form in 1953 and to have a top speed of 482 mph at 35,000 ft. with full internal fuel and ammunition. Another version planned for 1955 would have had 10,000 eshp., 35° sweep, a supersonic propeller, and would have boasted a top speed of 513 mph at 35,000 ft. More prosaic versions of the Skyshark were also planned: an ASW aircraft with an exaggerated humpback containing additional crew positions similar to the Fairey Gannet ASW versions used by the Royal Navy, an electronics countermeasures version, an airborne early warning aircraft, and night attack versions. In the event, none of these developments materalized.

Progress on the XA2D-1 and the XT40-A-2 appeared to be in parallel until mid-1948, when test-stand running of the XT40-A-1 revealed a series of seemingly minor problems that continued to delay the 50 hour test-stand qualification of the engine required for delivery of flight cleared engines. Douglas received engines for ground running and taxi test only in August, 1949, though the first airframe had been virtually complete since April, 1949. Not until May, 1950, was BuAer. 122988 trucked from the Douglas El Segundo plant to Edwards AFB for the beginning of flight tests.

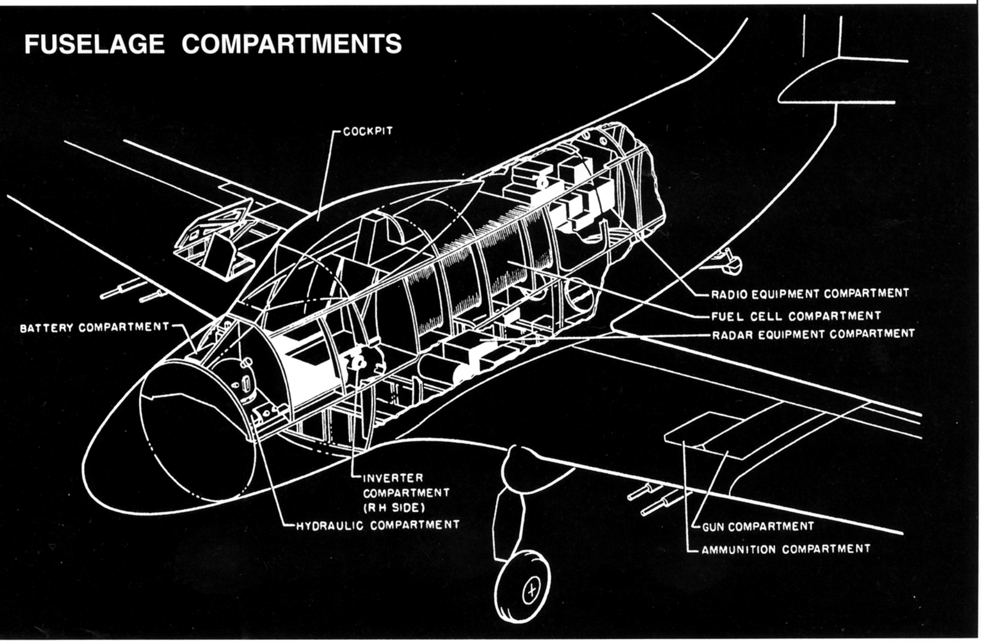


STATIONS AND FRAMES

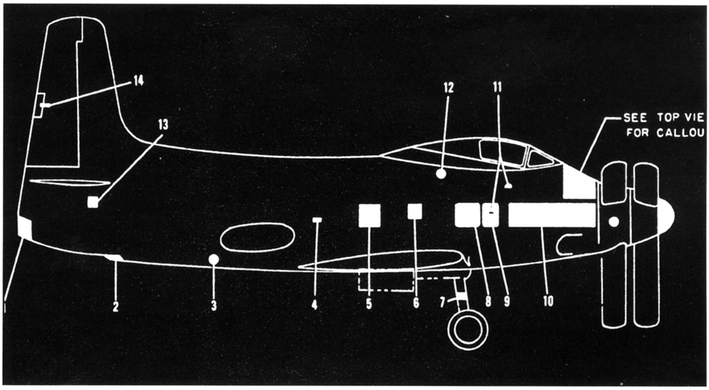


RADAR INSTALLATION

FUSELAGE COMPARTMENTS

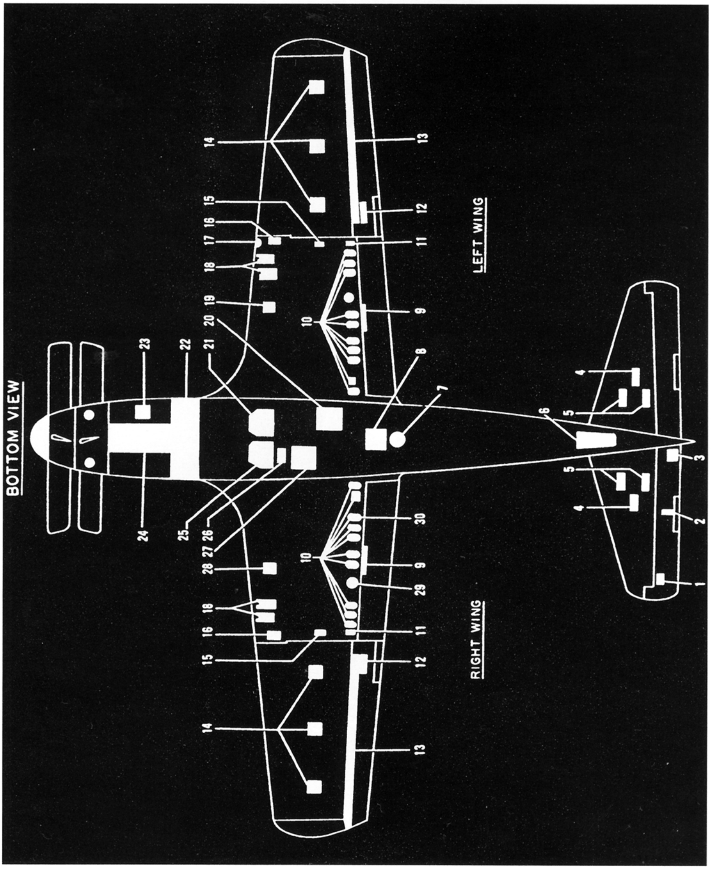


ACCESS AND INSPECTION PANELS



RIGHT SIDE VIEW

1.) Aft Fuselage Tip and Electrical Access
2.) Arresting Hook Faring and Attach-Fitting Access
3.) Tail Gear Hinge Access
4.) Defuel Valve Control
5.) Defuel Valve Inspection and Repair Access
6.) Fuselage Equipment Inspection Door
7.) Cockpit Access Step Bar
8.) Upper-Engine and Spark Plug Access Door
9.) Engine Controls Forward Access Door
10.) Engine Upper Access Door and Work Platform
11.) Cockpit Access Step-Plates
12.) Forward Hoist Fitting Access
13.) Arresting Gear Fail-Safe Mechanism Access Door
14.) Rudder Trim Tab Hinge Fairing and Access



BOTTOM VIEW

1.) Elevator Outboard Hinge Access
2.) Elevator Trim-Tab Hinge Access
3.) Horizontal Stabilizer Horn-Assembly Bearing Access
4.) Elevator Tab Control Mechanism Access
5.) AN/APN-1 Radio Altimeter Antennas Access
6.) Tail Cone Access and Arresting Hook Bumper Replacement Access
7.) AN/APX-6 Antenna Access
8.) Fuselage Lower Aft Access Door
9.) Flap Actuating Mechanism Access
10.) Center Wing Structure Inspection and Electrical Access Plates
11.) Flap Outboard Hinge Pin Torquing Access
12.) Aileron Trim Tab Adjusting Mechanism Access
13.) Aileron Hinge Access Panel
14.) Outboard Wing Panel Inspection and Repair Access Plates
15.) Aileron Bellcrank Assembly Stop-Adjustment Access
16.) Wing-Locking Pin Inspection Plates
17.) Approach Light Adjustment Access
18.) Gun Barrel Latch Access Doors
19.) Center Wing Inspection and Repair Access
20.) Center Wing Left Hand Aft Access Door
21.) Center Wing Left Hand Forward Access Door
22.) Engine and Oil Cooler Lower Access Door
23.) Auxiliary Power Unit Disconnect Coupling Access
24.) Engine Lower Access Panel
25.) Center Wing Right Hand Forward Access Door
26.) External Electric Power Receptacle Access
27.) Center Wing Right Hand Aft Access Door
28.) Gun Camera Access Plate
29.) Free Air Temperature Bulb Access
30.) Flap Position Indicator Transmitter Access

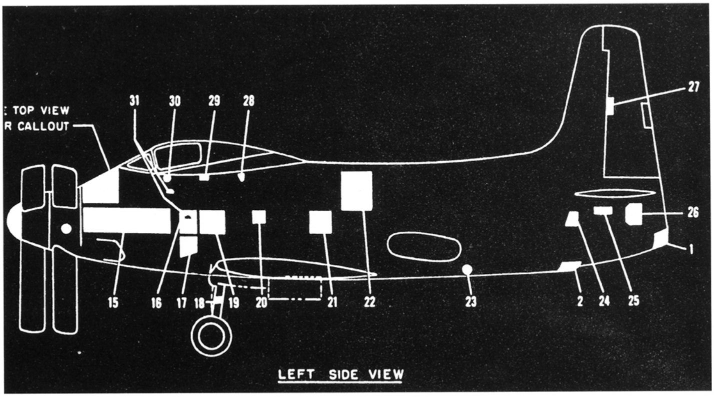
ACCESS AND INSPECTION PANELS

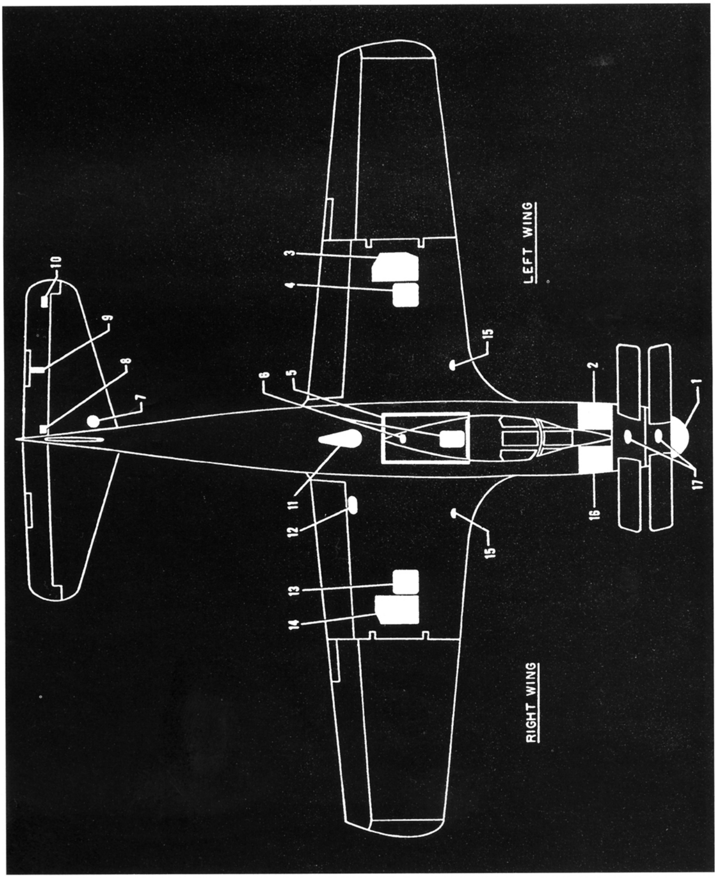
LEFT SIDE VIEW

15.) Engine Upper Access Door and Work Platform
16.) Engine Controls Forward Access Door
17.) Engine Lower Forward Access Door
18.) Cockpit Access Step-Bar
19.) Upper-Engine and Spark Plug Access Door
20.) Fuselage Equipment Inspection Door
21.) Fuel Boost Pump Access Door
22.) Radio Equipment Compartment and Aft Fuselage Access Door
23.) Tail Gear Hinge Access
24.) Arresting Gear Hold-Down Cylinder Snubber Access Door
25.) Horizontal Stabilizer Position Indicator Transmitter Access Door
26.) Horizontal Stabilizer Actuator and Arresting Gear Snubber Filler
27.) Rudder Trim Tab Actuator Access
28.) Forward Hoist Fitting Access
29.) Fuselage Fuel Cell Filler Access Door
30.) Cockpit Access Control Handle
31.) Cockpit Access Step-Plates

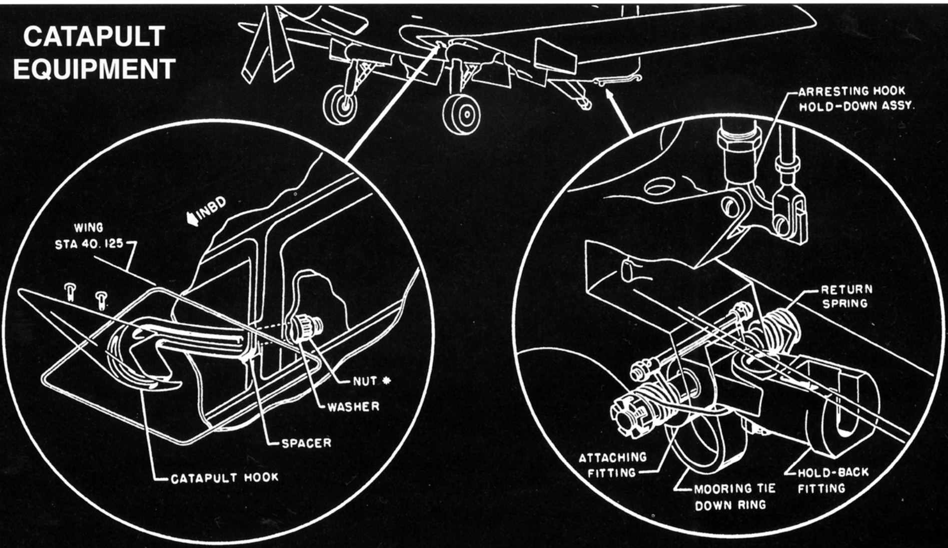
TOP VIEW

1.) Spinner Radome
2.) Hydraulic Equipment Access Door
3.) Left Hand Gun Compartment Access Door
4.) Left Hand Ammunition and Gun Pneumatic Equipment Compartment Access Door
5.) Fuel Compartment Access
6.) Fuel Cell and Quantity Tank Unit Access
7.) Aft Hoist Fitting Access Cover
8.) Horizontal Stabilizer Horn Assembly Bearing Access
9.) Elevator Trim Tab Hinge Access
10.) Elevator outboard hinge access
11.) AN/ARN-6 Radio Compass Antenna Access
12.) Flap Position Indicator Mechanism Access
13.) Right Hand Ammunition and Gun Pneumatic Equipment Compartment Access Door
14.) Right Hand Gun Compartment Access Door
15.) Hand Grip-Plates
16.) Electrical Equipment Compartment Access Door
17.) Propeller Spinner Access 4-places

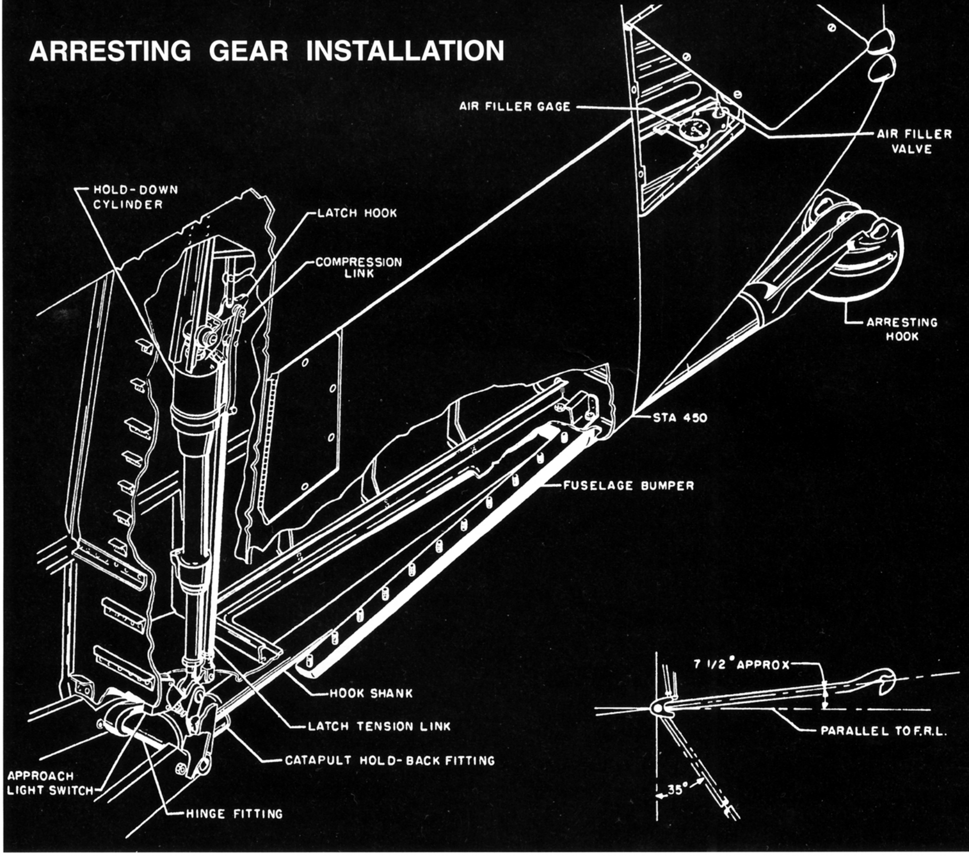




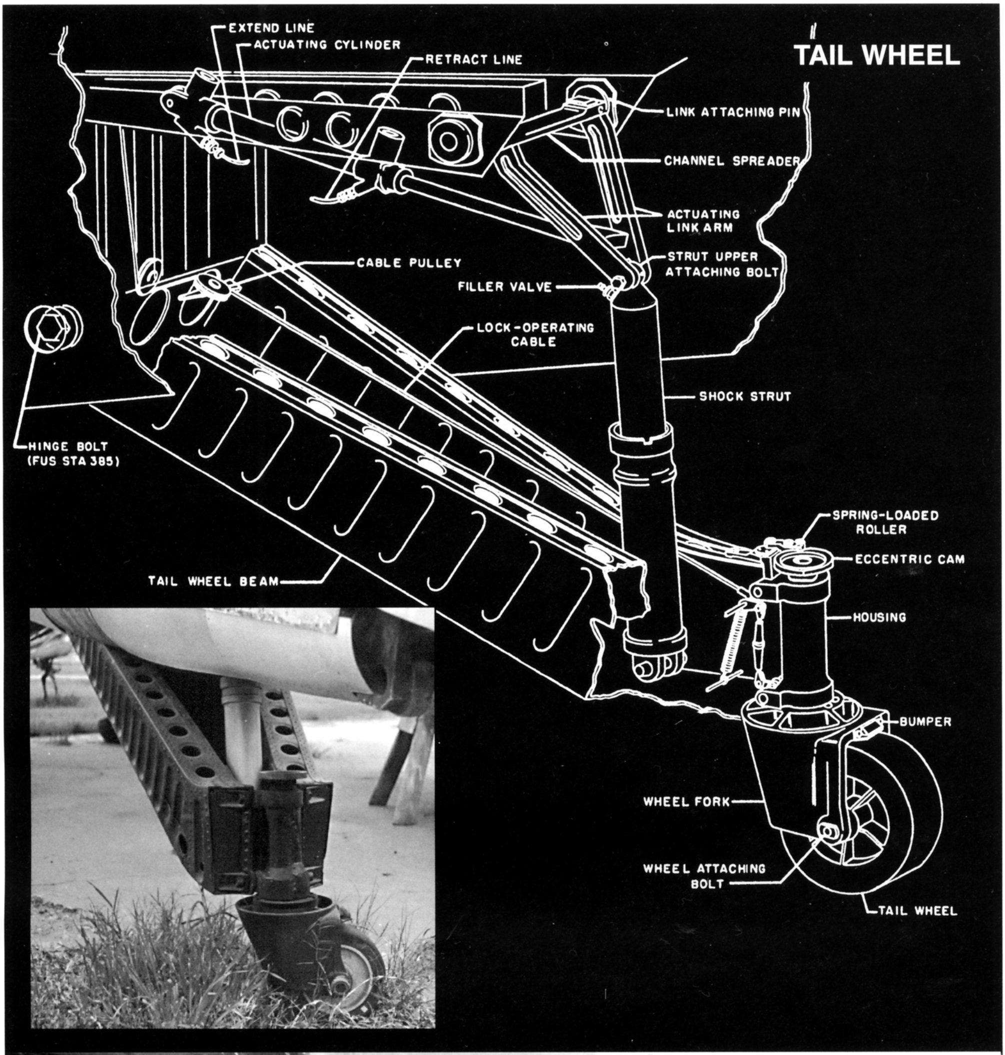
CATAPULT EQUIPMENT

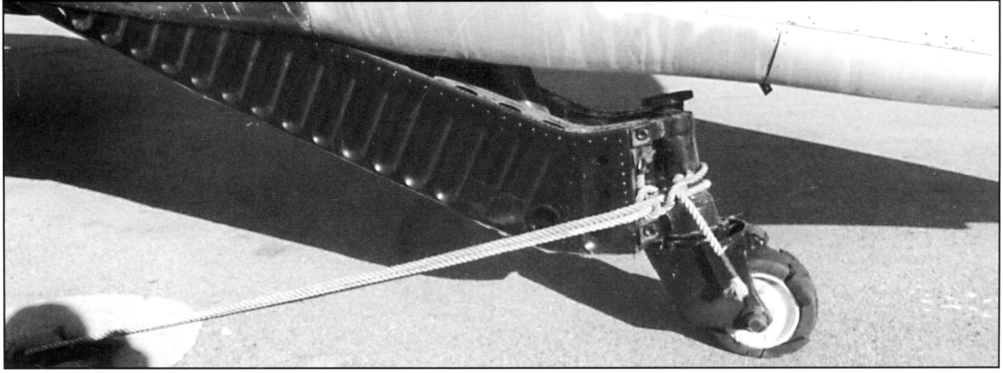


ARRESTING GEAR INSTALLATION

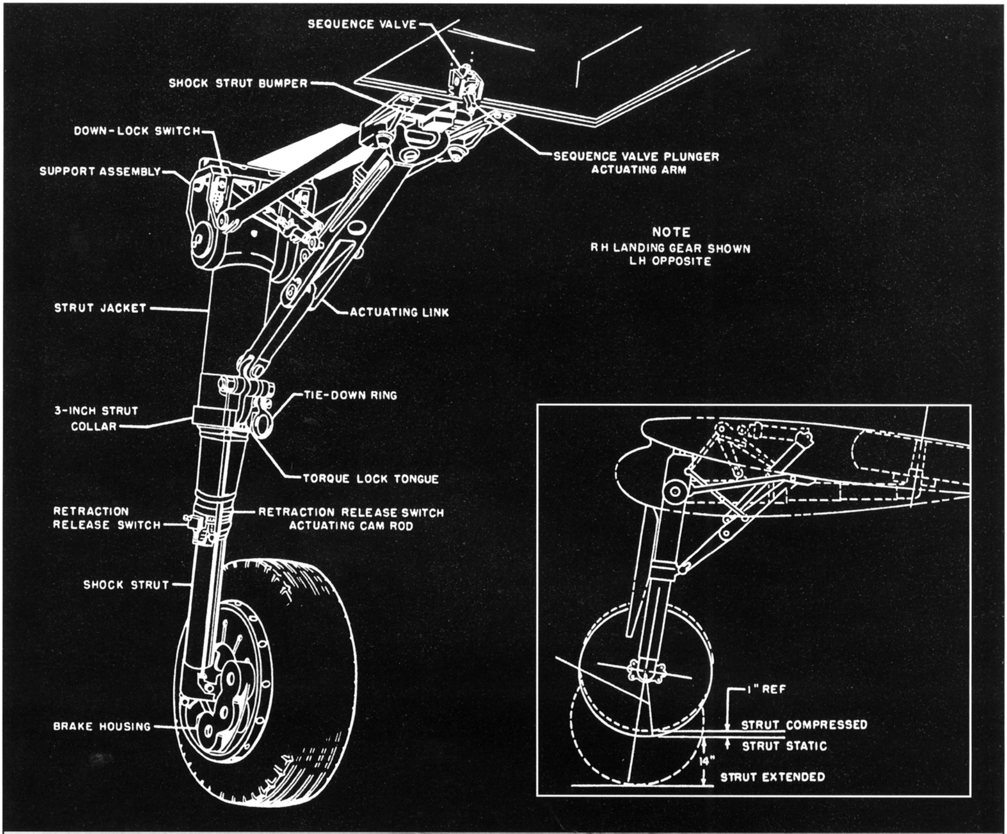


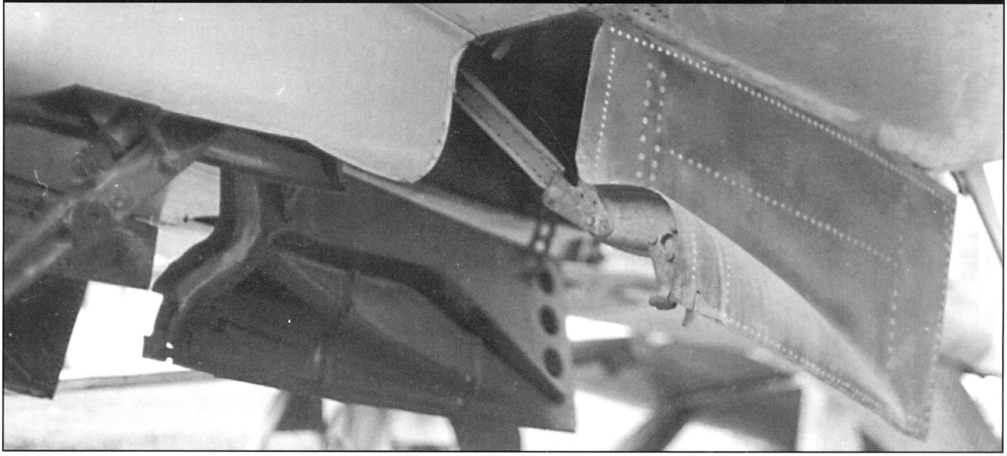
TAIL WHEEL


EXTEND LINE
ACTUATING CYLINDER
RETRACT LINE
LINK ATTACHING PIN
CHANNEL SPREADER
ACTUATING LINK ARM
STRUT UPPER ATTACHING BOLT
CABLE PULLEY
FILLER VALVE
LOCK-OPERATING CABLE
SHOCK STRUT
HINGE BOLT (FUS STA 385)
SPRING-LOADED ROLLER
ECCENTRIC CAM
TAIL WHEEL BEAM
HOUSING
BUMPER
WHEEL FORK
WHEEL ATTACHING BOLT
TAIL WHEEL

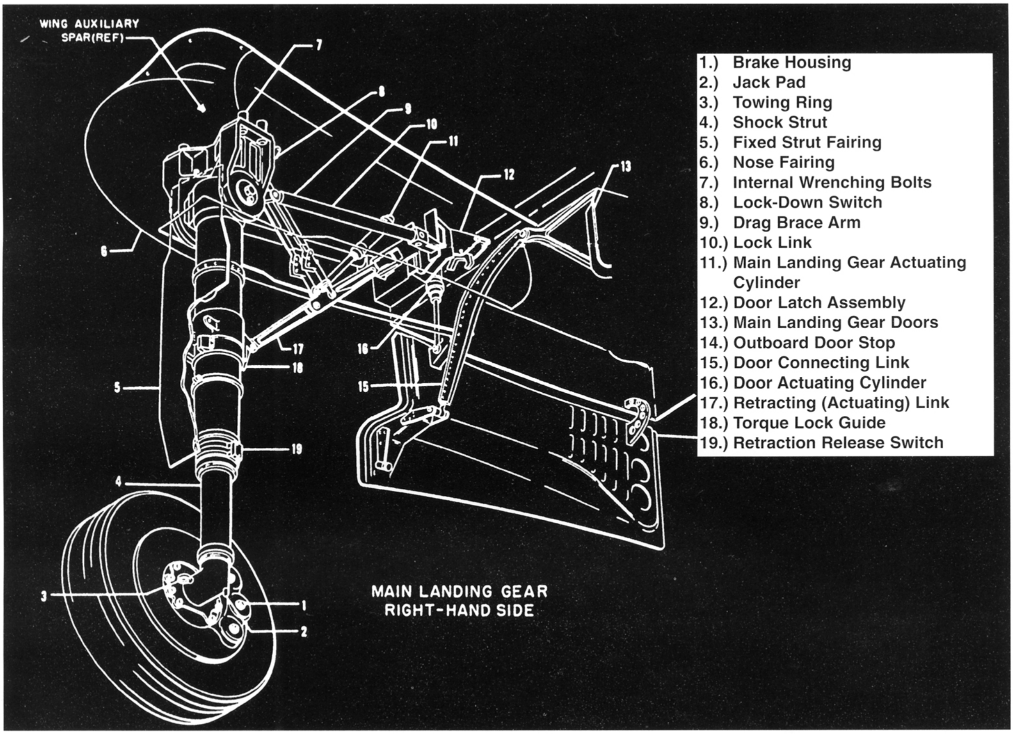


A2D-1 SKYSHARK MAIN LANDING GEAR



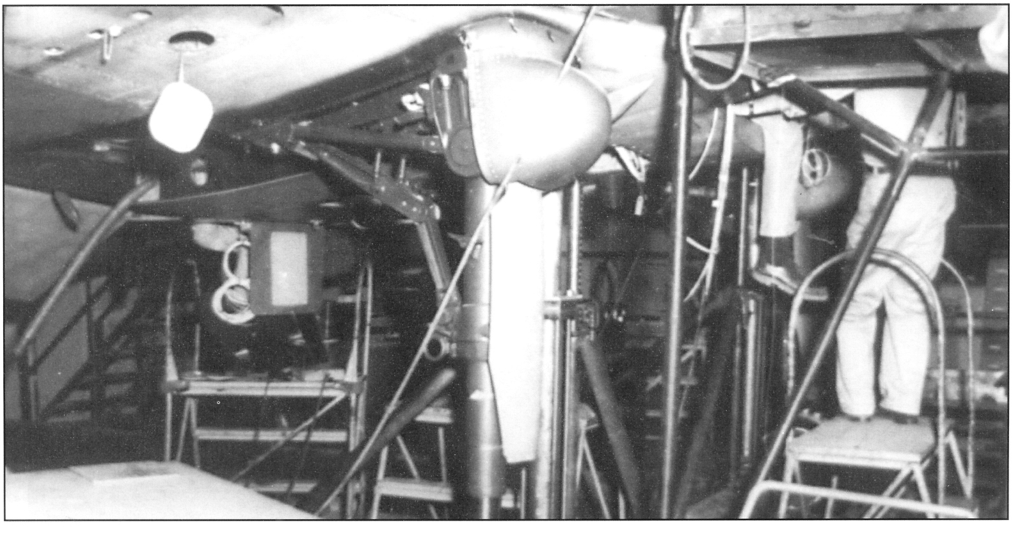


A2D-1 SKYSHARK MAIN LANDING GEAR

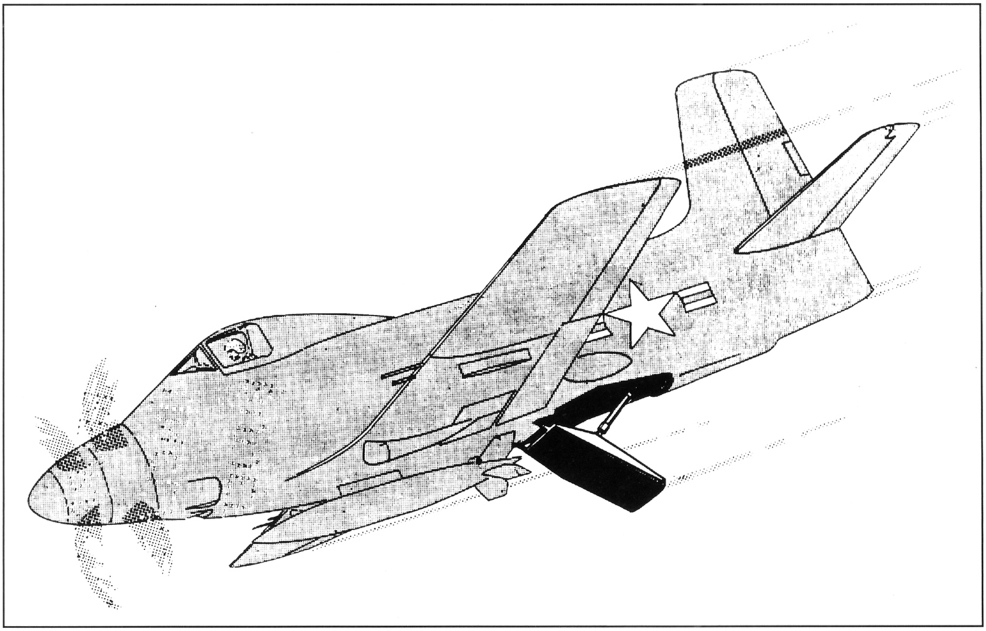


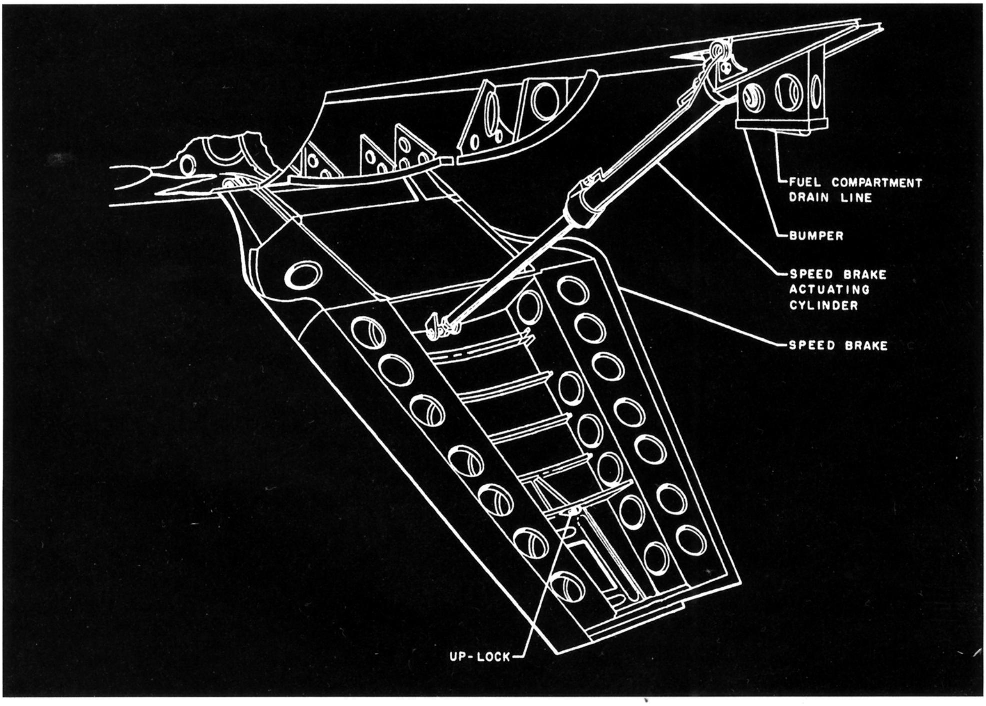
1.) Brake Housing
2.) Jack Pad
3.) Towing Ring
4.) Shock Strut
5.) Fixed Strut Fairing
6.) Nose Fairing
7.) Internal Wrenching Bolts
8.) Lock-Down Switch
9.) Drag Brace Arm
10.) Lock Link
11.) Main Landing Gear Actuating Cylinder
12.) Door Latch Assembly
13.) Main Landing Gear Doors
14.) Outboard Door Stop
15.) Door Connecting Link
16.) Door Actuating Cylinder
17.) Retracting (Actuating) Link
18.) Torque Lock Guide
19.) Retraction Release Switch

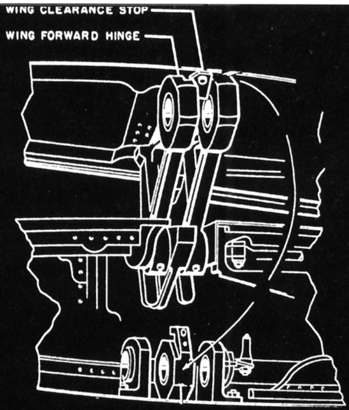
Below, installation of main right landing gear on production A2D-1 #1 BuNo. 125480 on 6-23-52. (National Archives)

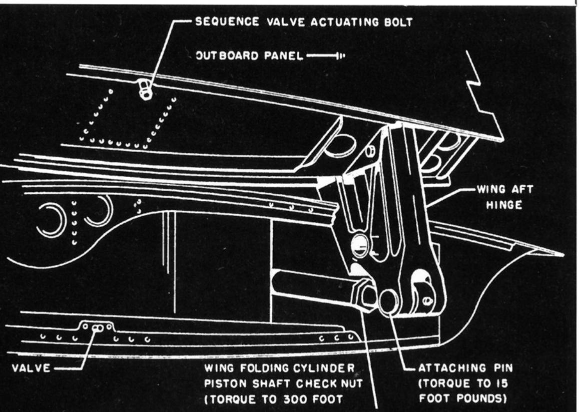


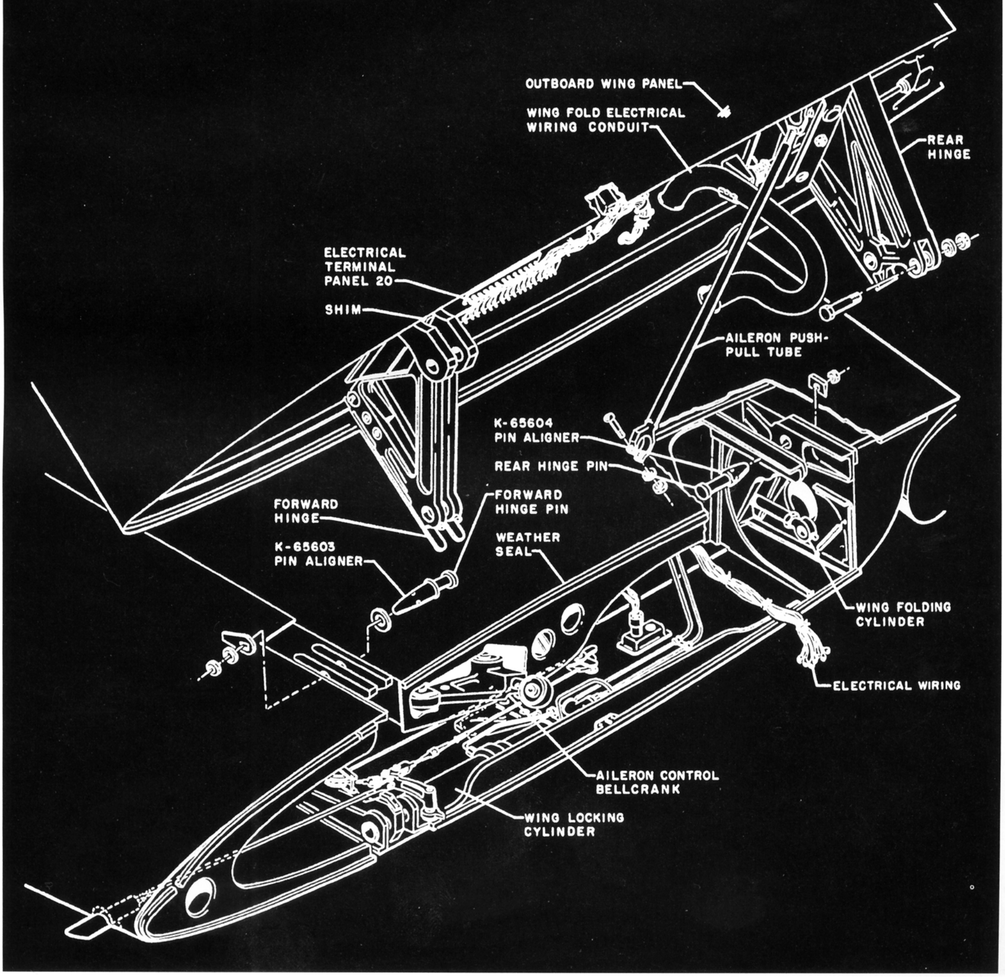
SPEED BRAKE



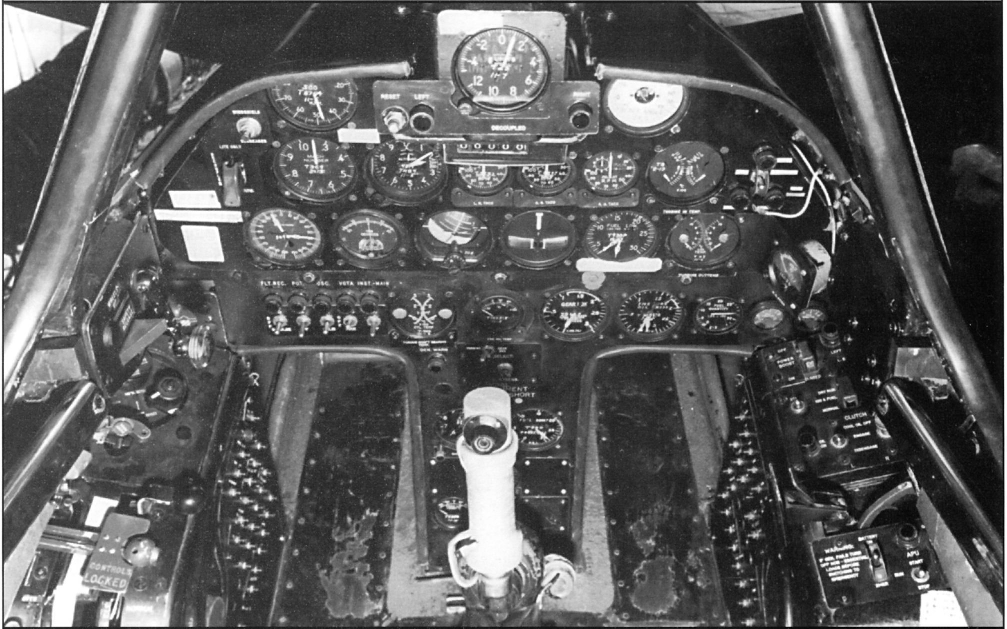

FUEL COMPARTMENT DRAIN LINE
BUMPER
SPEED BRAKE ACTUATING CYLINDER
SPEED BRAKE
UP-LOCK

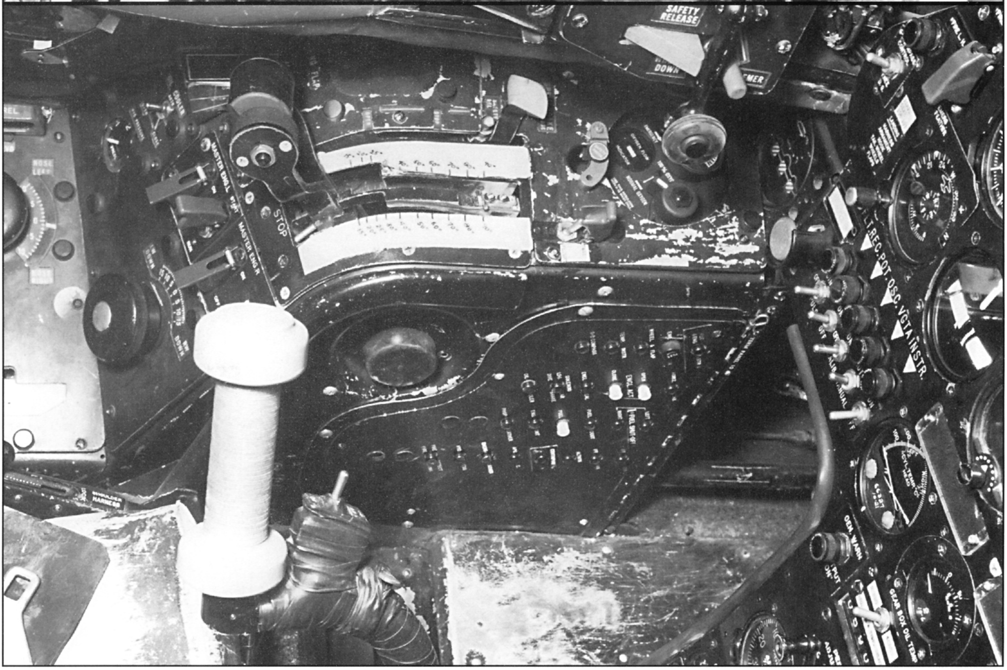

WING CLEARANCE STOP
WING FORWARD HINGE


SEQUENCE VALVE ACTUATING BOLT
OUTBOARD PANEL
WING AFT HINGE
VALVE
WING FOLDING CYLINDER PISTON SHAFT CHECK NUT (TORQUE TO 300 FOOT
ATTACHING PIN (TORQUE TO 15 FOOT POUNDS)


OUTBOARD WING PANEL
WING FOLD ELECTRICAL WIRING CONDUIT
REAR HINGE
ELECTRICAL TERMINAL PANEL 20
SHIM
AILERON PUSH-PULL TUBE
K-65604 PIN ALIGNER
REAR HINGE PIN
FORWARD HINGE
FORWARD HINGE PIN
K-65603 PIN ALIGNER
WEATHER SEAL
WING FOLDING CYLINDER
ELECTRICAL WIRING
AILERON CONTROL BELLCRANK
WING LOCKING CYLINDER

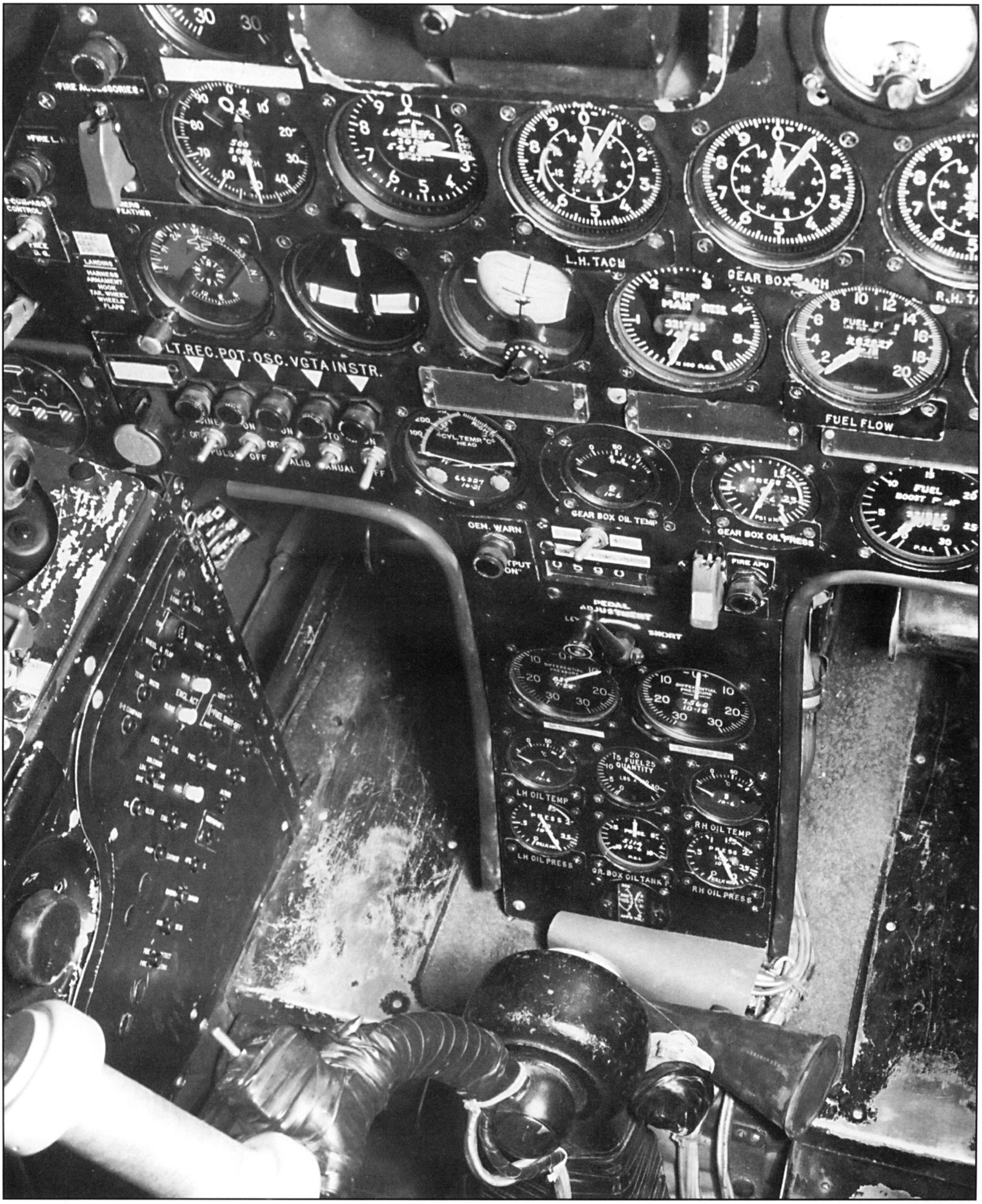
XA2D-1 122988 INSTRUMENT PANEL



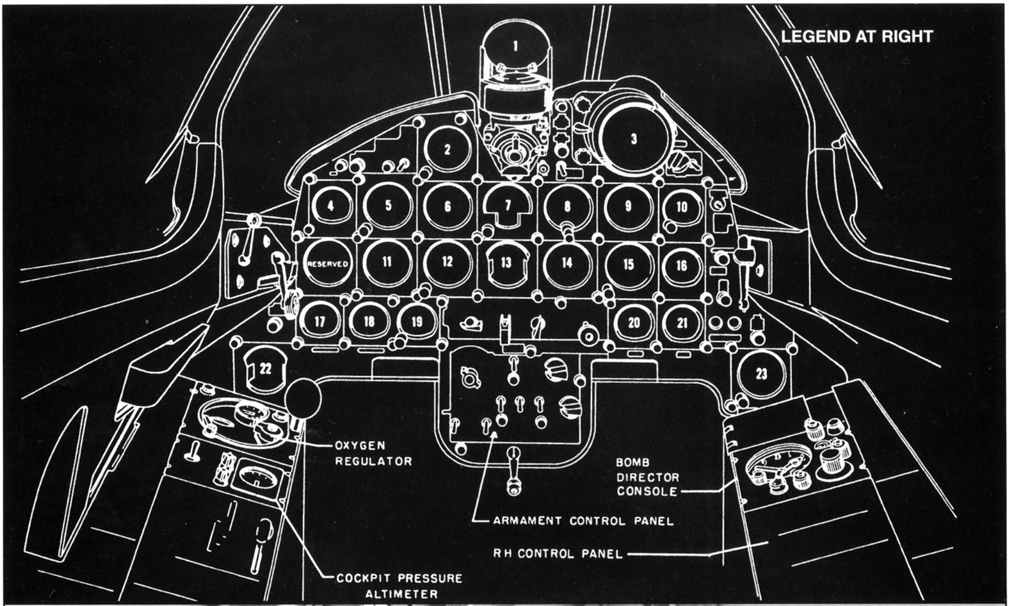


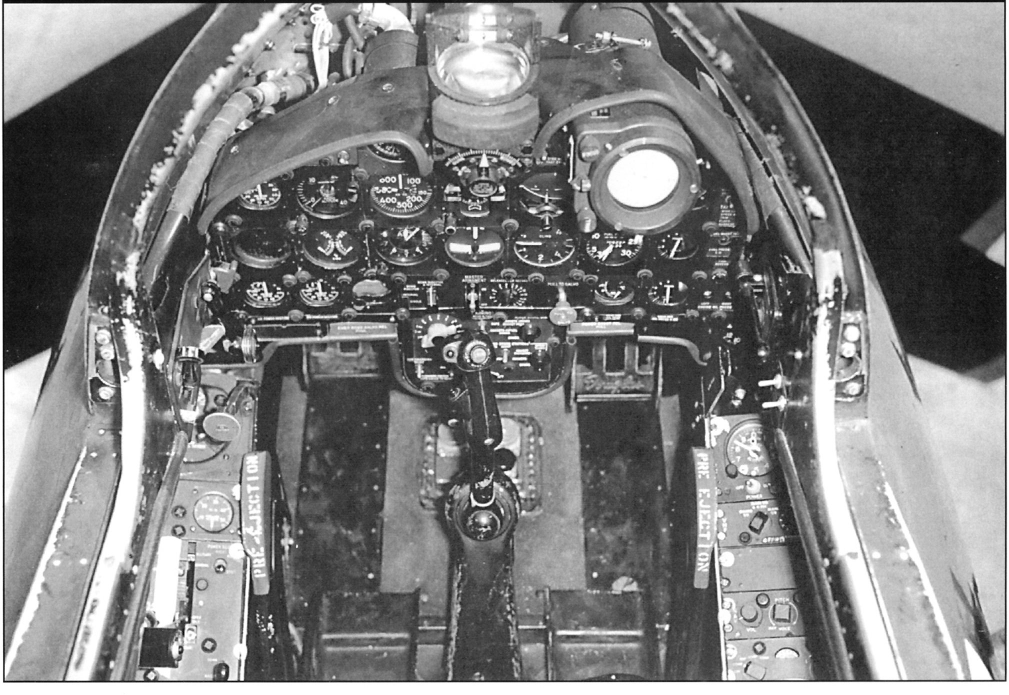
XA2D-1 122989 COCKPIT INSTRUMENTS

At left, note decoupler at the top center of 122988's instrument panel. (MFR) At left bottom, left hand pilot's console as installed on XA2D-1 122899. (MFR) Below, 122899 was more heavily instrumented than 122898. (MFR)



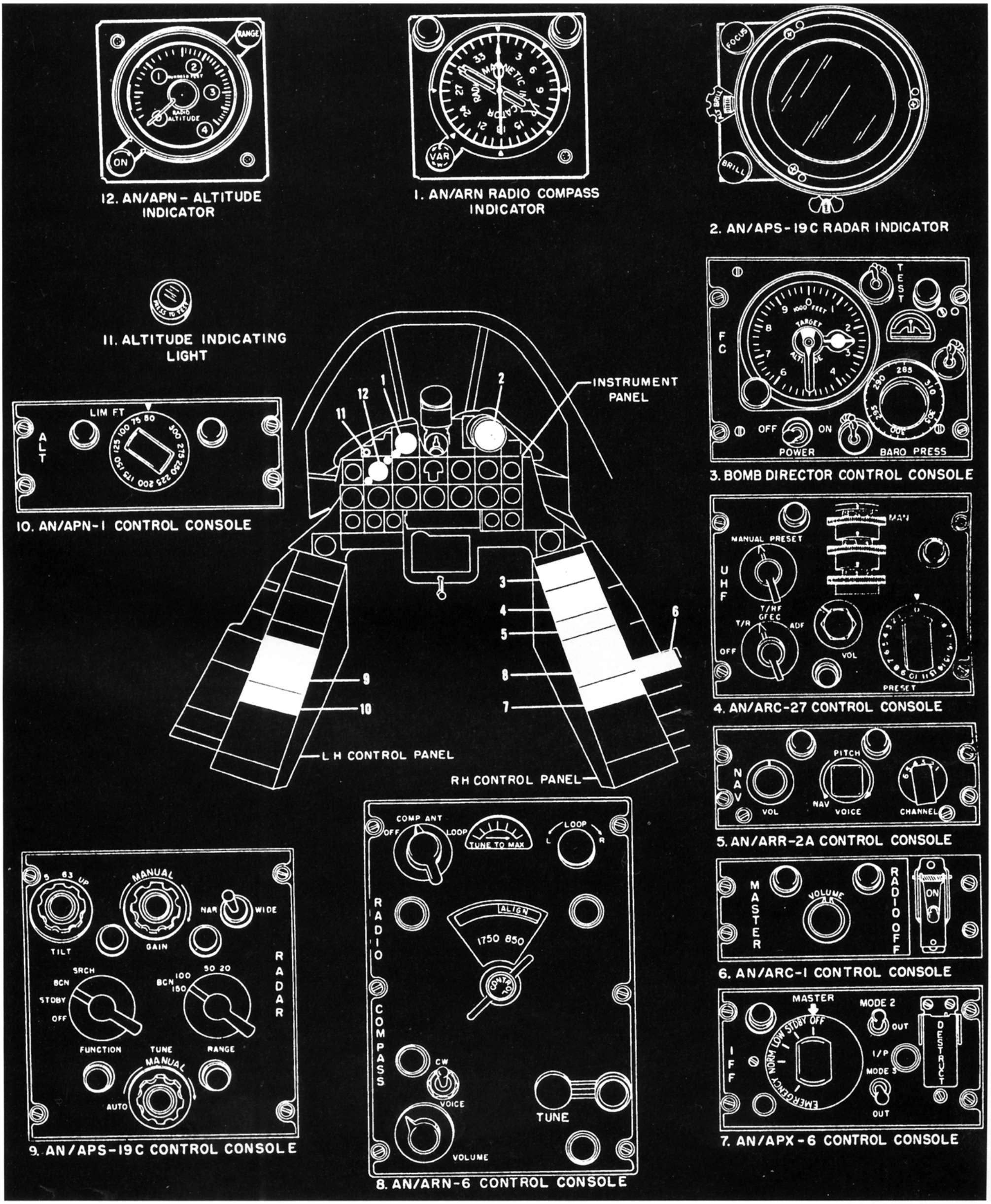
PRODUCTION AIRCRAFT INSTRUMENT PANEL





RADIO AND RADAR CONTROL CONSOLES AND INSTRUMENTS

1.) Gun Sight
2.) Radio Compass
3.) Radar Scope
4.) Prop Tachometer
5.) Radar Altimeter
6.) Airspeed Indicator
7.) Master Direction Indicator
8.) Gyro Horizon Indicator
9.) Fuel Quantity Indicator
10.) Standard Small Clock
11.) Turbine Inlet Temp. Ind.
12.) Altimeter
13.) Turn and Bank Ind.
14.) Rate of Climb Indicator
15.) Fuel Flow Indicator
16.) Fuel Boost Pressure Ind.
17.) LH Power Sec. Tach.
18.) RH Power Sec. Tach.
19.) Elapsed Time Clock
20.) Oil Temperature Ind.
21.) Gear Box Oil Pressure Ind.
22.) Landing Gear and Wing Flap Position Indicator
23.) Accelerometer



12. AN/APN – ALTITUDE INDICATOR

1. AN/ARN RADIO COMPASS INDICATOR

2. AN/APS-19C RADAR INDICATOR

11. ALTITUDE INDICATING LIGHT

10. AN/APN-1 CONTROL CONSOLE

3. BOMB DIRECTOR CONTROL CONSOLE

4. AN/ARC-27 CONTROL CONSOLE

5. AN/ARR-2A CONTROL CONSOLE

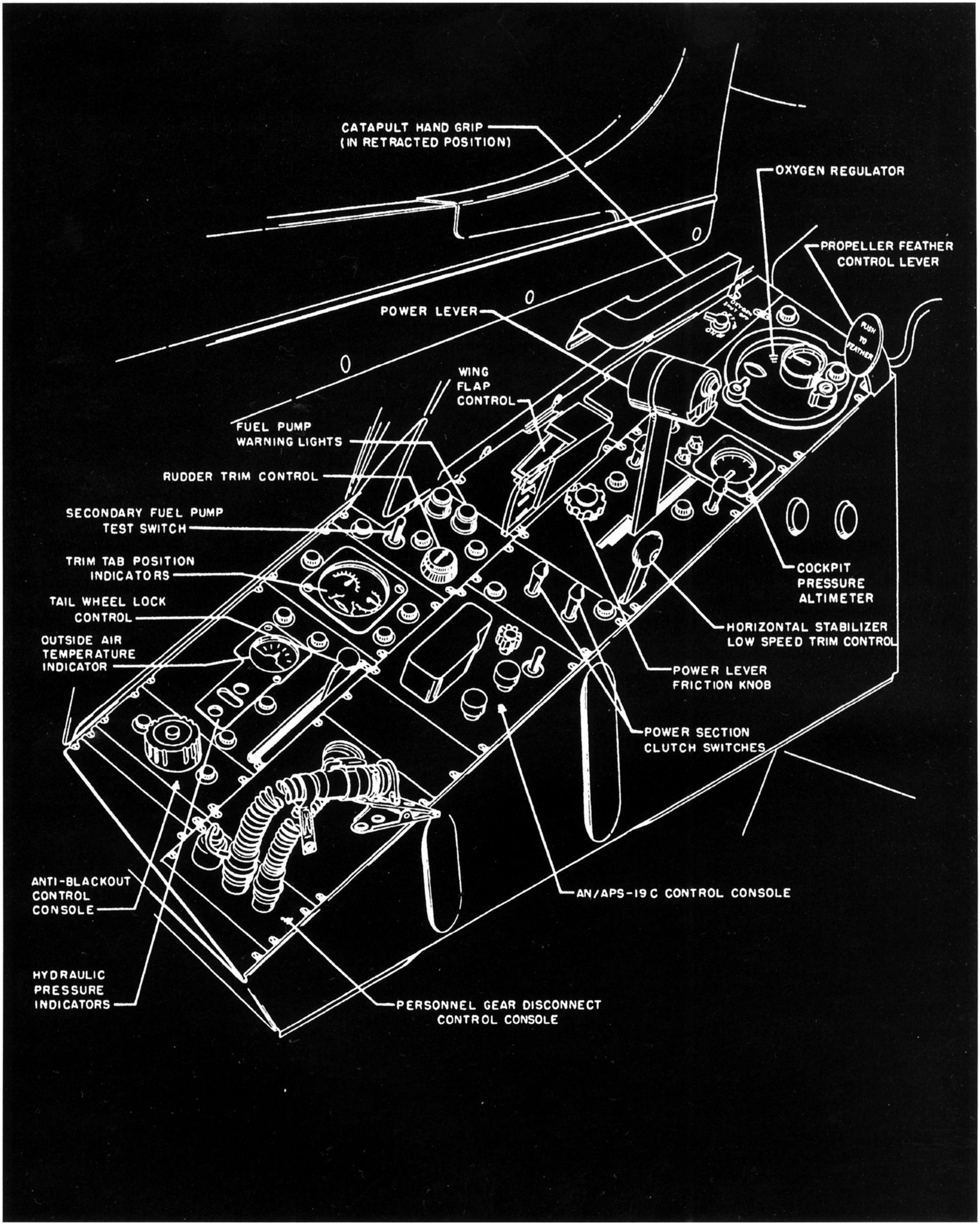
6. AN/ARC-1 CONTROL CONSOLE

9. AN/APS-19C CONTROL CONSOLE

8. AN/ARN-6 CONTROL CONSOLE

7. AN/APX-6 CONTROL CONSOLE

PILOT'S LEFT HAND CONSOLE, PRODUCTION AIRCRAFT


CATAPULT HAND GRIP (IN RETRACTED POSITION)
OXYGEN REGULATOR
PROPELLER FEATHER CONTROL LEVER
PUSH TO FEATHER
POWER LEVER
WING FLAP CONTROL
FUEL PUMP WARNING LIGHTS
RUDDER TRIM CONTROL
SECONDARY FUEL PUMP TEST SWITCH
TRIM TAB POSITION INDICATORS
TAIL WHEEL LOCK CONTROL
OUTSIDE AIR TEMPERATURE INDICATOR
COCKPIT PRESSURE ALTIMETER
HORIZONTAL STABILIZER LOW SPEED TRIM CONTROL
POWER LEVER FRICTION KNOB
POWER SECTION CLUTCH SWITCHES
AN/APS-19C CONTROL CONSOLE
ANTI-BLACKOUT CONTROL CONSOLE
HYDRAULIC PRESSURE INDICATORS
PERSONNEL GEAR DISCONNECT CONTROL CONSOLE

PILOT'S LEFT HAND CONSOLE, PRODUCTION AIRCRAFT 125481

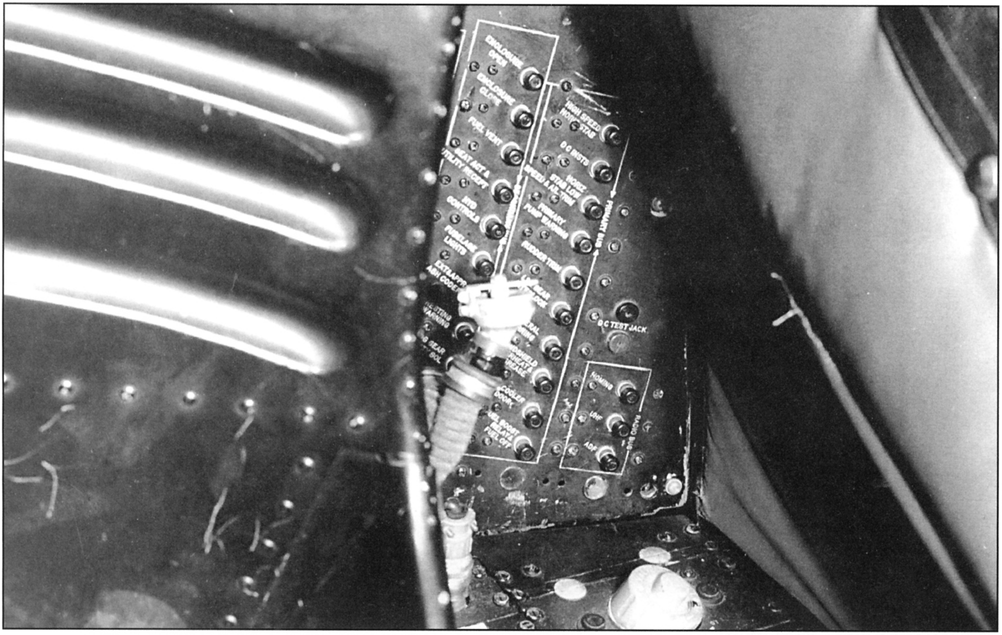
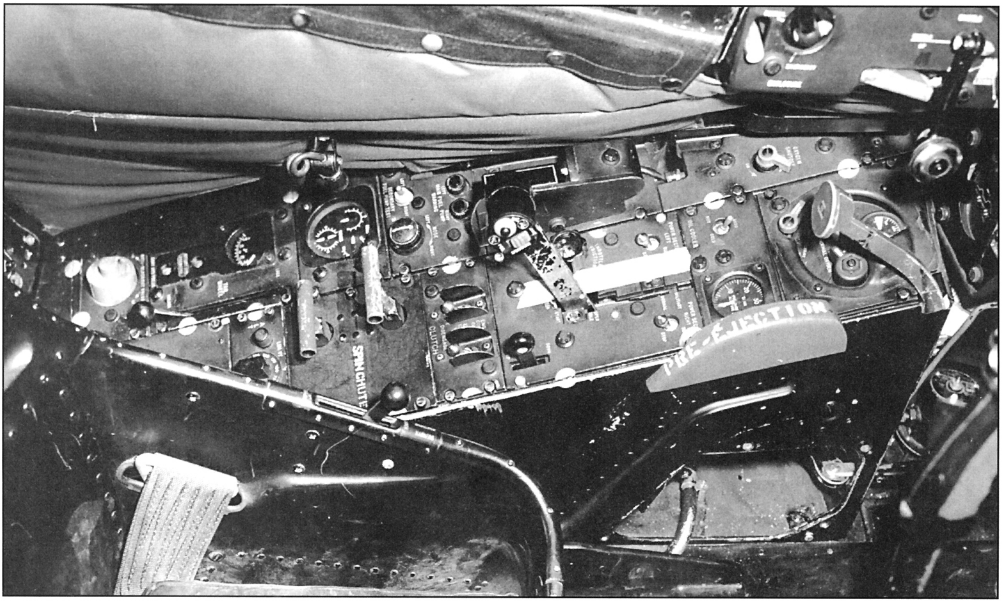
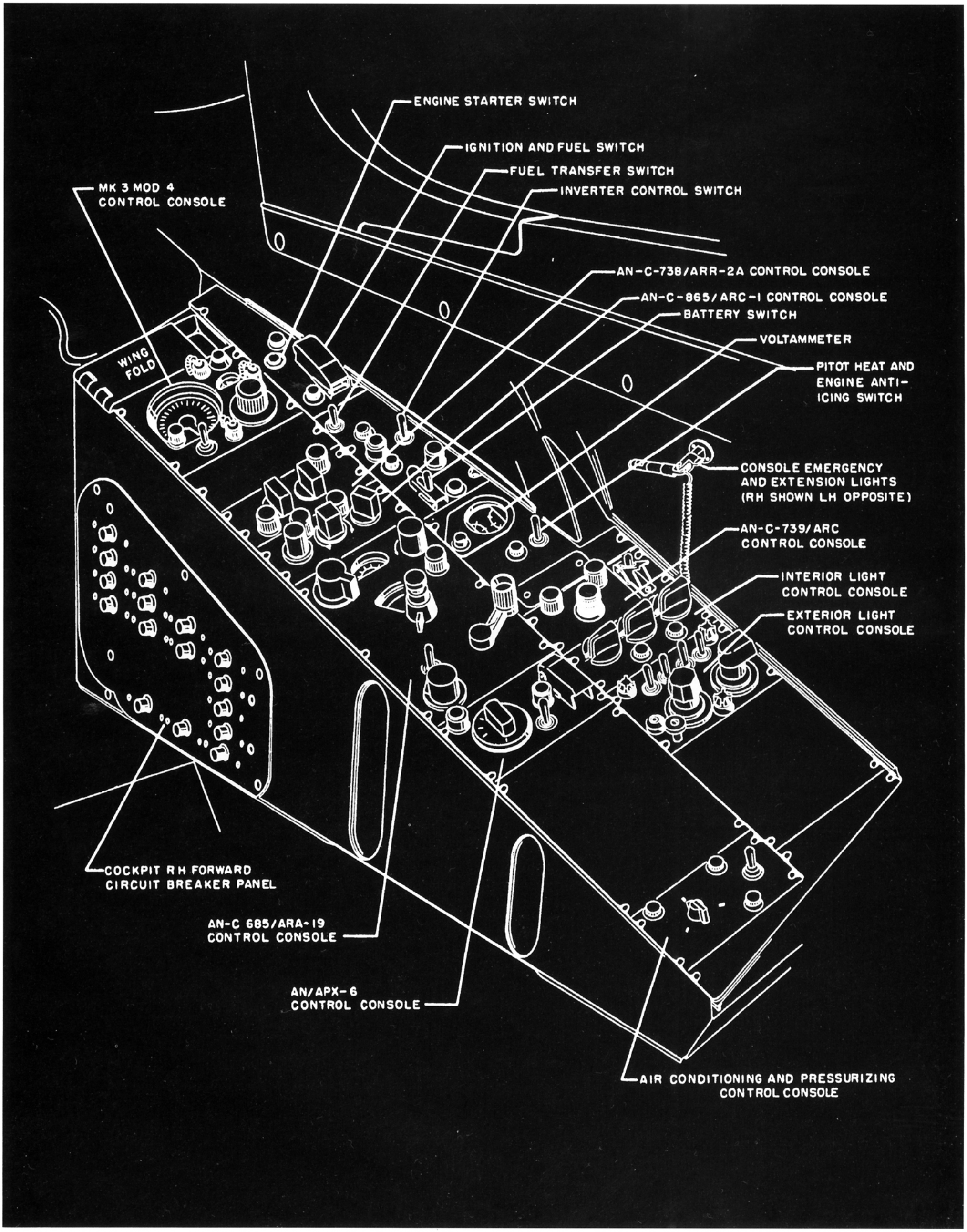


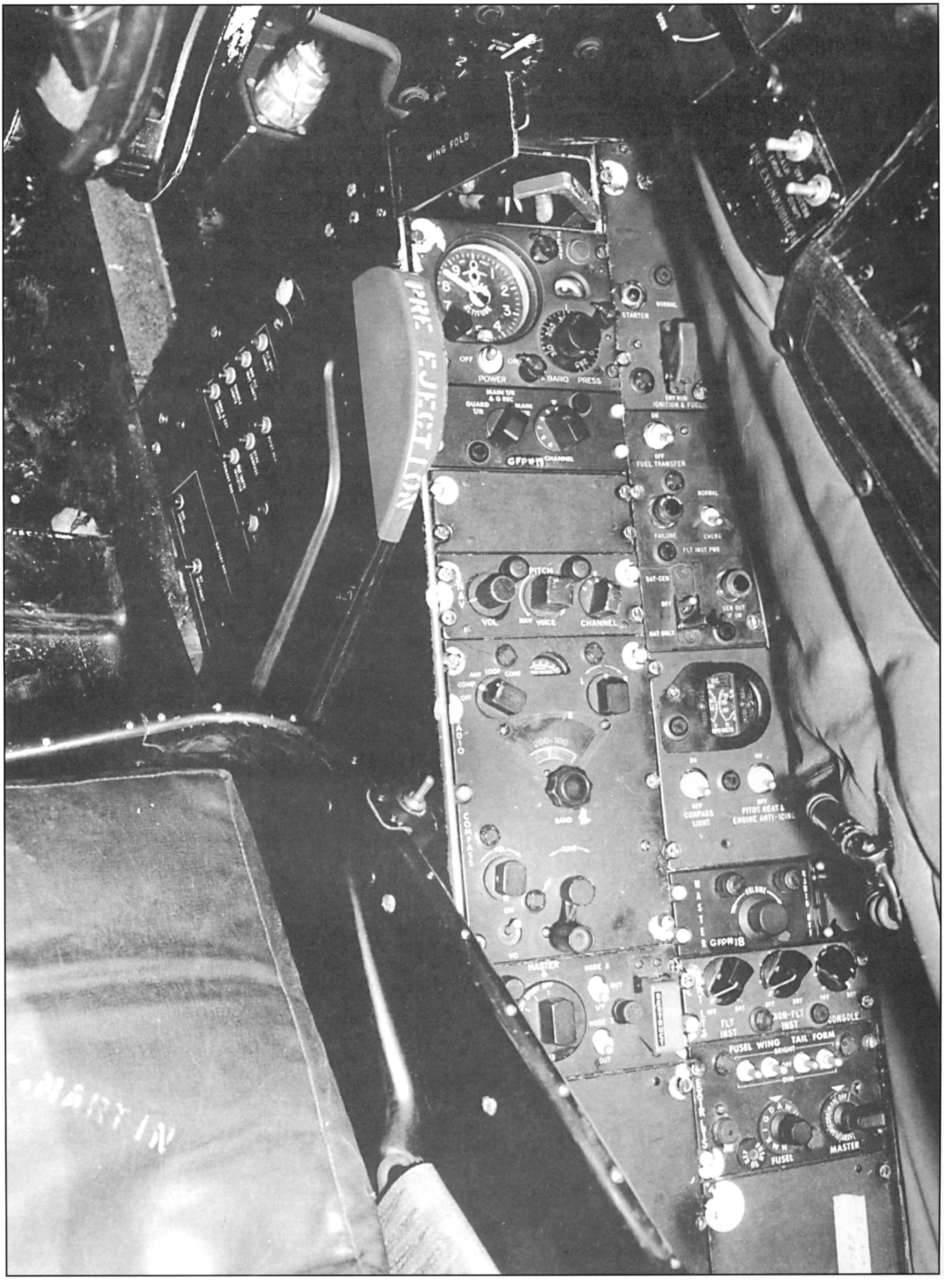
Photo above, circuit breaker board located behind the left side of the pilot's seat. (National Archives)



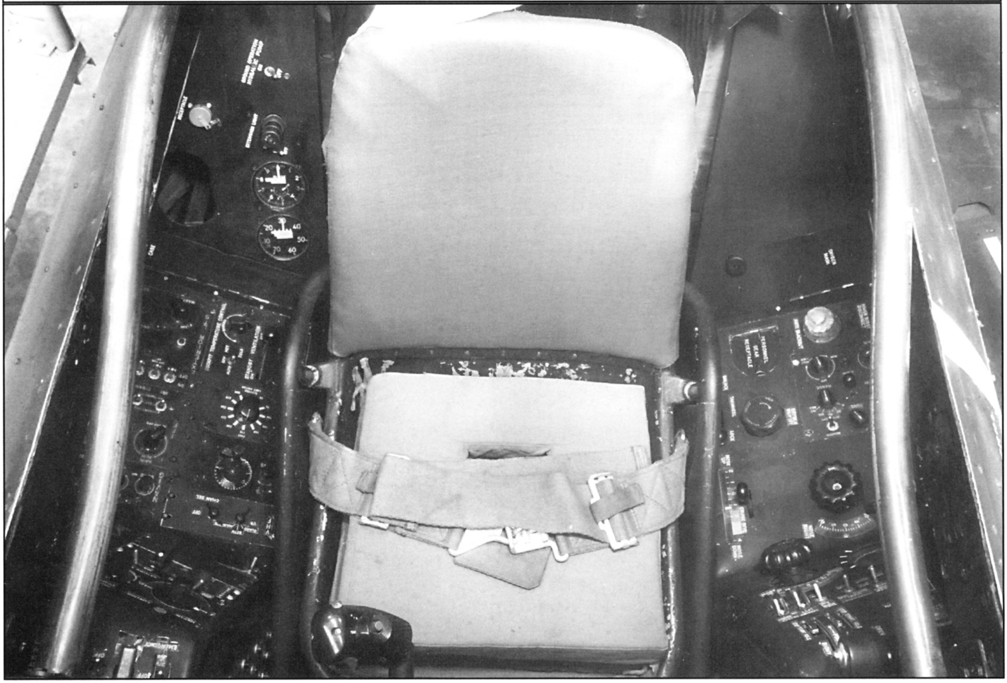
PILOT'S RIGHT HAND CONSOLE, PRODUCTION AIRCRAFT


ENGINE STARTER SWITCH
IGNITION AND FUEL SWITCH
FUEL TRANSFER SWITCH
INVERTER CONTROL SWITCH
MK 3 MOD 4 CONTROL CONSOLE
WING FOLD
AN-C-738/ARR-2A CONTROL CONSOLE
AN-C-865/ARC-1 CONTROL CONSOLE
BATTERY SWITCH
VOLTAMMETER
PITOT HEAT AND ENGINE ANTI-ICING SWITCH
CONSOLE EMERGENCY AND EXTENSION LIGHTS (RH SHOWN LH OPPOSITE)
AN-C-739/ARC CONTROL CONSOLE
INTERIOR LIGHT CONTROL CONSOLE
EXTERIOR LIGHT CONTROL CONSOLE
COCKPIT RH FORWARD CIRCUIT BREAKER PANEL
AN-C 685/ARA-19 CONTROL CONSOLE
AN/APX-6 CONTROL CONSOLE
AIR CONDITIONING AND PRESSURIZING CONTROL CONSOLE

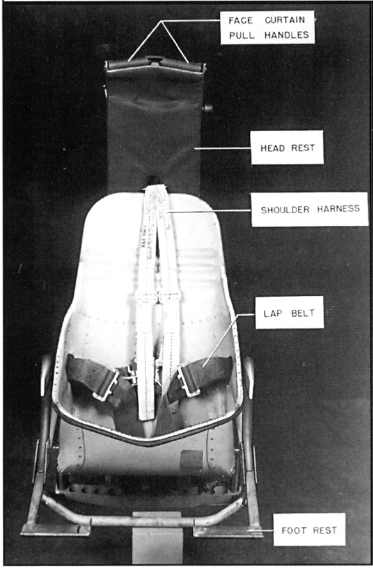
PILOT'S RIGHT HAND CONSOLE A2D-1 125481

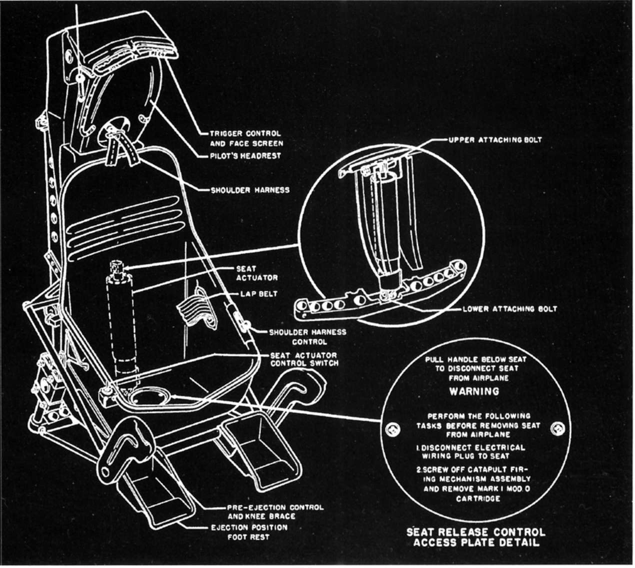


ORIGINAL PROTOTYPE PILOT'S SEAT ON 12 SEPTEMBER 1947

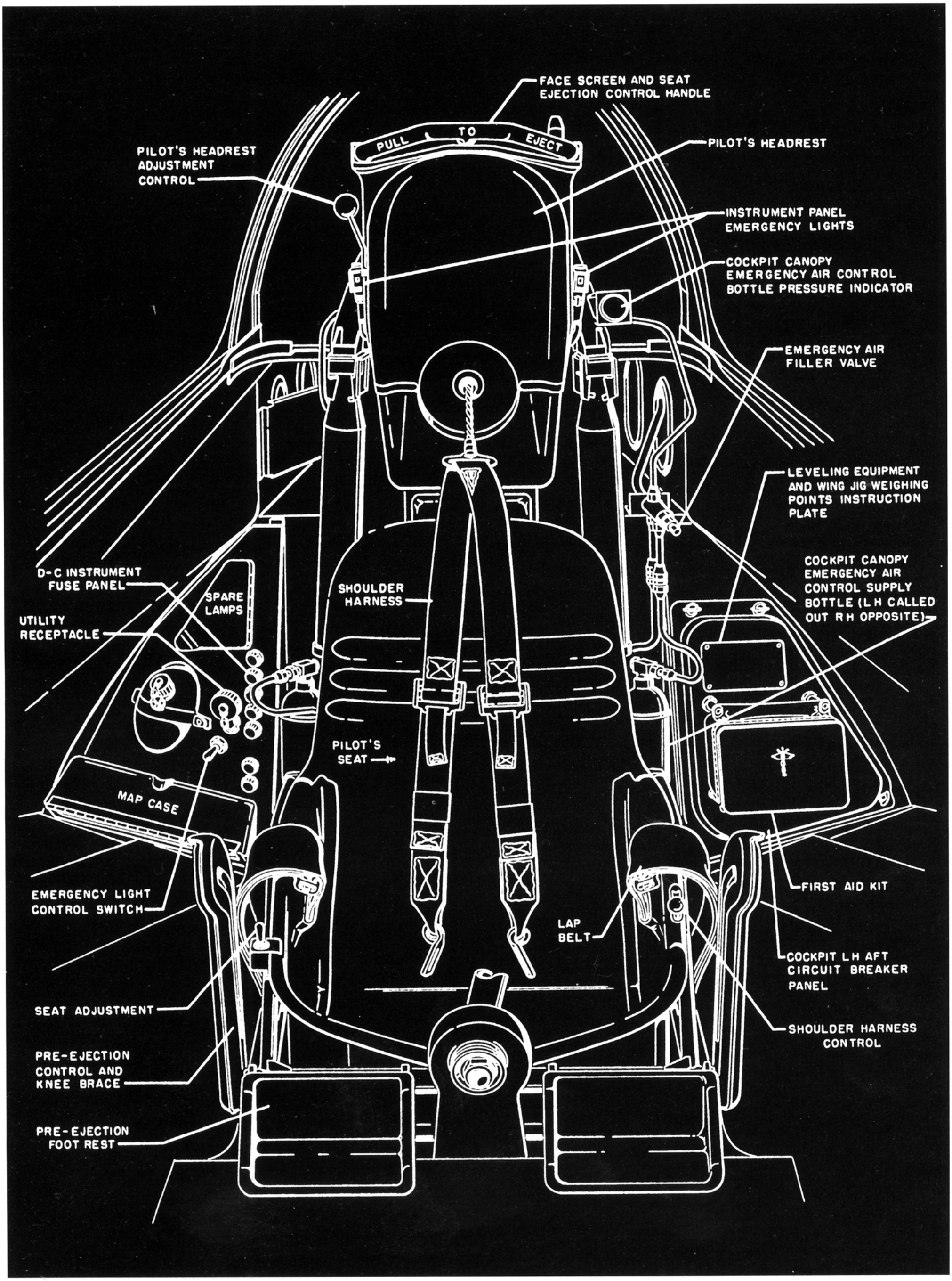


PILOT'S PRODUCTION EJECTION SEAT

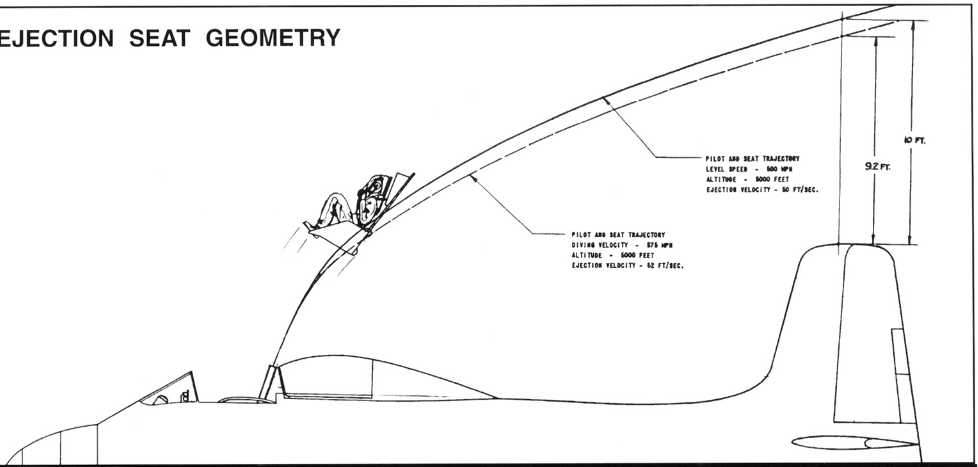



TRIGGER CONTROL AND FACE SCREEN
PILOT'S HEADREST
SHOULDER HARNESS
SEAT ACTUATOR
LAP BELT
SHOULDER HARNESS CONTROL
SEAT ACTUATOR CONTROL SWITCH
PRE-EJECTION CONTROL AND KNEE BRACE
EJECTION POSITION FOOT REST
UPPER ATTACHING BOLT
LOWER ATTACHING BOLT
PULL HANDLE BELOW SEAT TO DISCONNECT SEAT FROM AIRPLANE
WARNING
PERFORM THE FOLLOWING TASKS BEFORE REMOVING SEAT FROM AIRPLANE
1. DISCONNECT ELECTRICAL WIRING PLUG TO SEAT
2. SCREW OFF CATAPULT FIRING MECHANISM ASSEMBLY AND REMOVE MARK I MOD 0 CARTRIDGE
SEAT RELEASE CONTROL ACCESS PLATE DETAIL

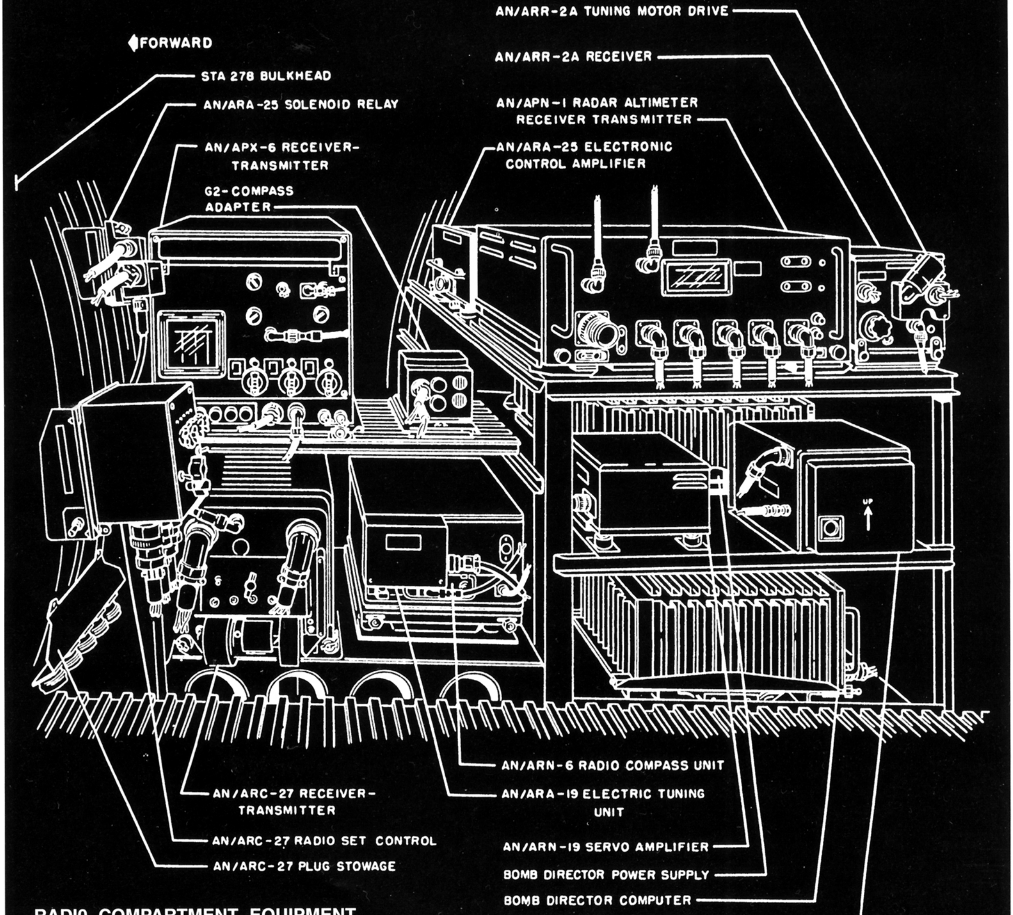
AFT PRODUCTION COCKPIT ARRANGEMENT


FACE SCREEN AND SEAT EJECTION CONTROL HANDLE
PULL TO EJECT
PILOT'S HEADREST ADJUSTMENT CONTROL
PILOT'S HEADREST
INSTRUMENT PANEL EMERGENCY LIGHTS
COCKPIT CANOPY EMERGENCY AIR CONTROL BOTTLE PRESSURE INDICATOR
EMERGENCY AIR FILLER VALVE
LEVELING EQUIPMENT AND WING JIG WEIGHING POINTS INSTRUCTION PLATE
COCKPIT CANOPY EMERGENCY AIR CONTROL SUPPLY BOTTLE (L H CALLED OUT R H OPPOSITE)
D-C INSTRUMENT FUSE PANEL
SPARE LAMPS
UTILITY RECEPTACLE
SHOULDER HARNESS
PILOT'S SEAT
MAP CASE
EMERGENCY LIGHT CONTROL SWITCH
FIRST AID KIT
LAP BELT
COCKPIT L H AFT CIRCUIT BREAKER PANEL
SEAT ADJUSTMENT
SHOULDER HARNESS CONTROL
PRE-EJECTION CONTROL AND KNEE BRACE
PRE-EJECTION FOOT REST

EJECTION SEAT GEOMETRY

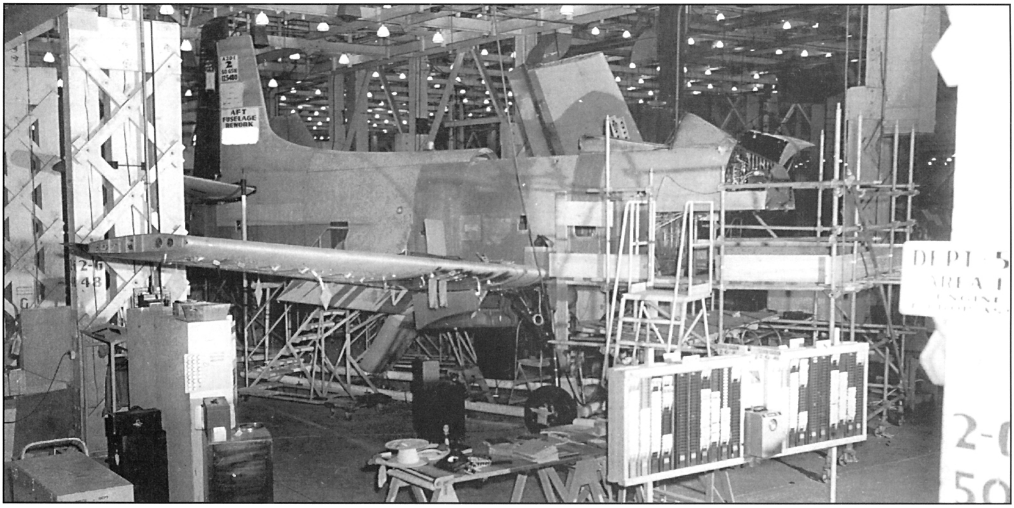


10 FT.
9.2 FT.
PILOT AND SEAT TRAJECTORY
LEVEL SPEED - 500 MPH
ALTITUDE - 5000 FEET
EJECTION VELOCITY - 50 FT/SEC.
PILOT AND SEAT TRAJECTORY
DIVING VELOCITY - 575 MPH
ALTITUDE - 5000 FEET
EJECTION VELOCITY - 52 FT/SEC.

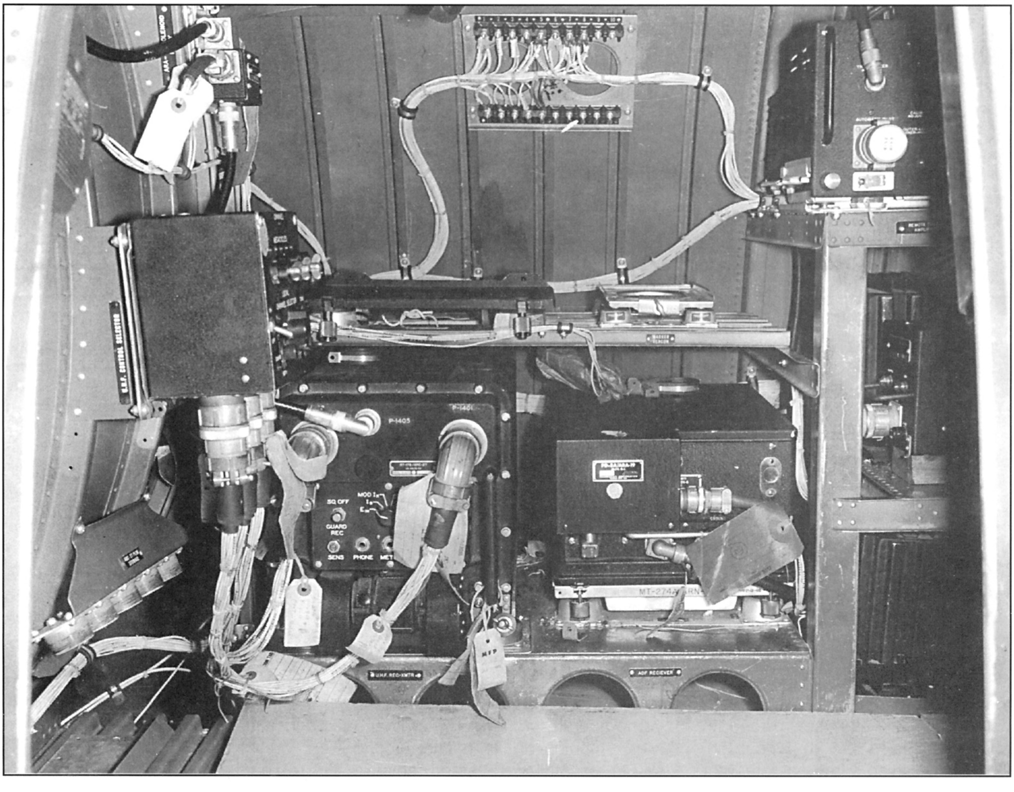


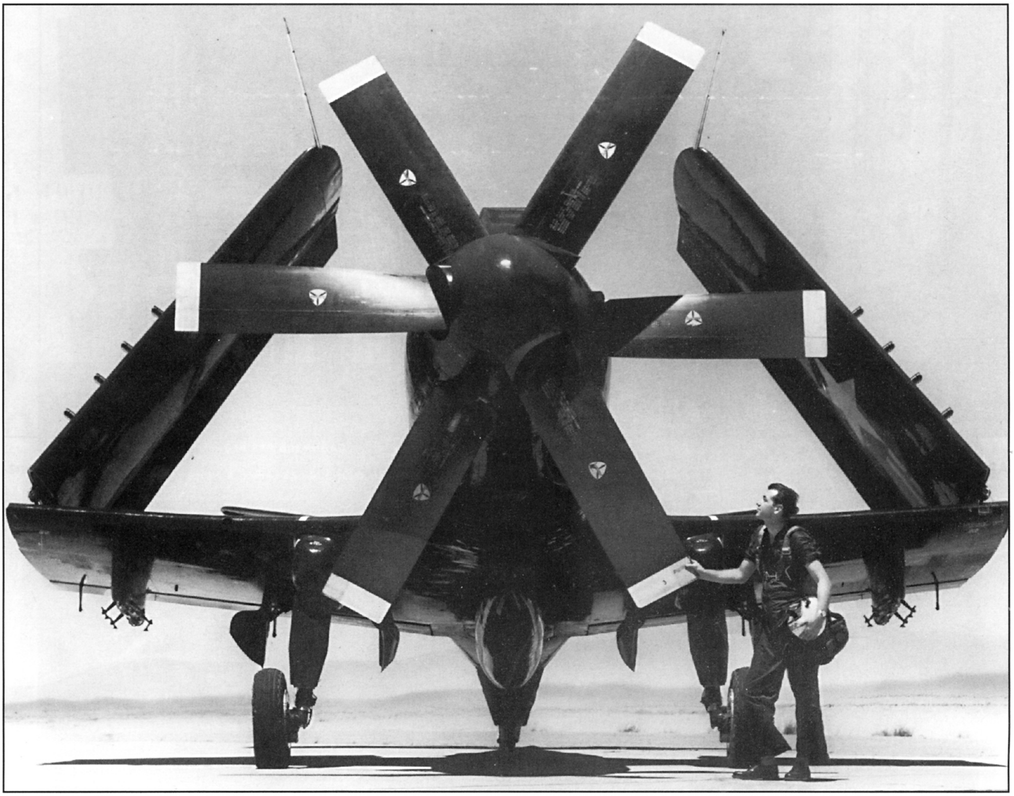
FORWARD
STA 278 BULKHEAD
AN/ARA-25 SOLENOID RELAY
AN/APX-6 RECEIVER-TRANSMITTER
G2-COMPASS ADAPTER
AN/ARR-2A TUNING MOTOR DRIVE
AN/ARR-2A RECEIVER
AN/APN-1 RADAR ALTIMETER RECEIVER TRANSMITTER
AN/ARA-25 ELECTRONIC CONTROL AMPLIFIER
UP
AN/ARC-27 RECEIVER-TRANSMITTER
AN/ARC-27 RADIO SET CONTROL
AN/ARC-27 PLUG STOWAGE
AN/ARN-6 RADIO COMPASS UNIT
AN/ARA-19 ELECTRIC TUNING UNIT
AN/ARN-19 SERVO AMPLIFIER
BOMB DIRECTOR POWER SUPPLY
BOMB DIRECTOR COMPUTER
BOMB DIRECTOR ALTIMETER

RADIO COMPARTMENT EQUIPMENT



A2D-1 125480 under construction on 12-22-52. Below, the AN/APX-6 and G-2 compass are missing from the radio compartment.





Above, George Jansen is dwarfed by the XA2D-1 Skyshark's 14 foot diameter Aeroproducts propellers. This early 1950 photo was taken at the Old South Base at Edwards AFB. Note long test booms on each wingtip and the original WWII-style main wing pylons. (via Gerry Markgraf)

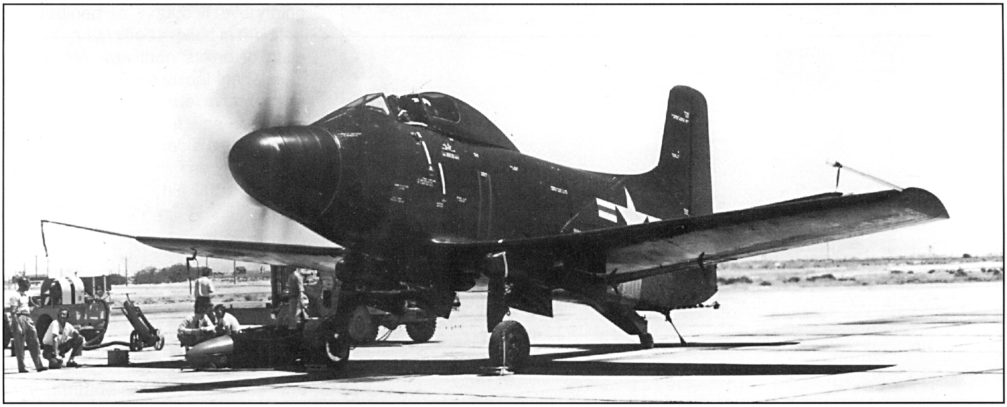
FLIGHT TEST

As previously recounted, the first flight on 26 May 1950 was a short one as were subsequent flights (13 minutes on June 1 and 35 minutes on June 2). Following the third flight, turbine vibration required that the engine be changed, and then a series of engine problems and changes delayed further flight test until October 18th.

The need for carrier-based attack aircraft with the Skyshark's capabilities was great following the start of the Korean War, and Navy orders for production A2D-1s were placed in quick succession. On 30 June 1950, Douglas received a letter of intent for 10 production Skysharks (BuAer 125479-488), followed by orders for an additional 81 Skysharks (BuAer 127962-8042) on 18 August 1950 and 250 more aircraft (BuAer 132793-3042) on 10 February 1951. Preparations were begun for an A2D production line at Douglas' El Segundo plant, with production of the aft fuselage sections and other items subcontracted to other manufacturers.

Flight test of the first Skyshark resumed at Edwards AFB on 18 October 1950, and a series of flights averaging one hour each were made in the aircraft throughout the fall and winter months of 1950. The second series of flights revealed several other "bugs" associated with the powerplant and propeller installation. Gear box failures, vibration, bearing failures, overheating of the fuselage skin around the exhausts, and long hours spent trying to schedule the engine, propellers, and throttle controller did much to discourage confidence in the aircraft's reliability.

The urgency of wartime forced



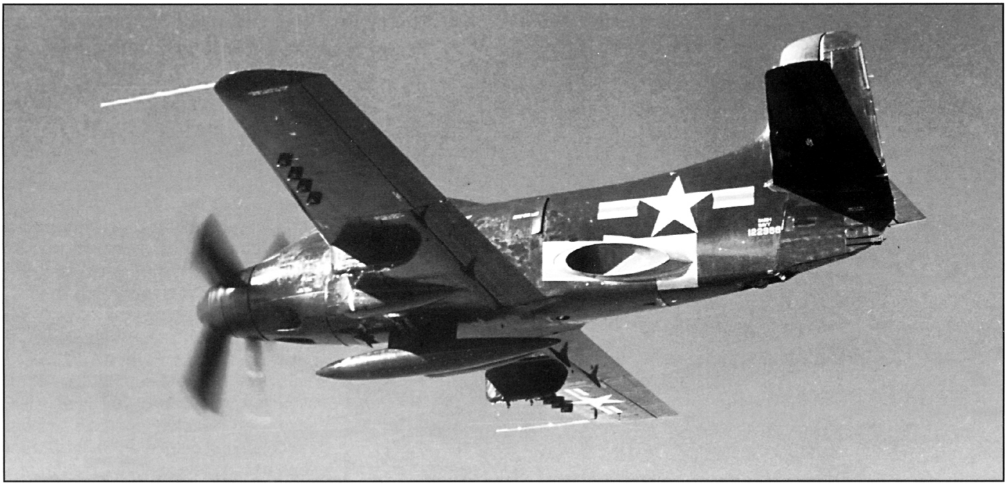
Above, the first XA2D-1 122988 is tied down at Edwards while undergoing engine tests. (via Gerry Markgraf)

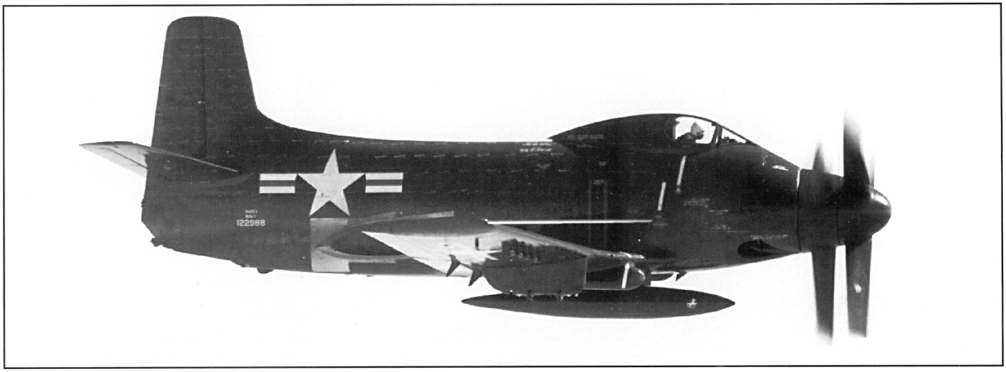
the Navy into consideration of a substitute powerplant for the Skyshark and, beginning in October 1950, Pratt & Whitney's 5,700 eshp XT34 was seriously considered for use in production A2Ds. However, the Navy felt that counter-rotating propellers would be necessary to counter the extremely high torque of the XT34 when installed in a single engine aircraft, and the XT34 did not have this feature. Pratt & Whitney's wartime commitments prevented them from undertaking the development of contrarotating propellers and the reduction gearing required, so use of the XT34 as a substitute powerplant for the A2D was rejected.

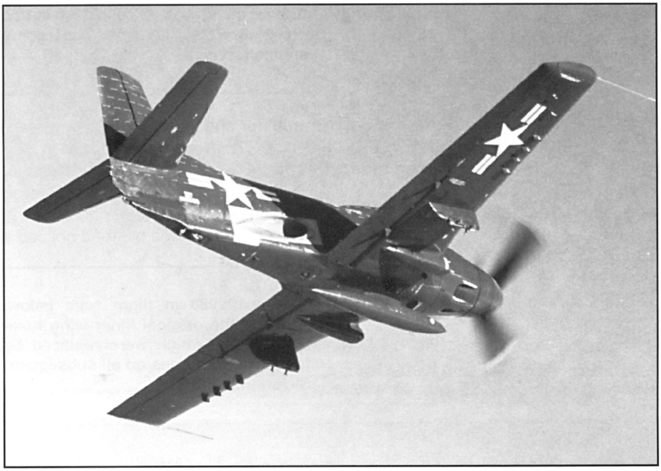
By 8 December 1950, the prototype Skyshark had made a total of 14 flights, reaching a top speed of 475 knots and a maximum altitude of 27,000 ft. The Navy began its Preliminary Evaluation of the aircraft starting in mid-December 1950. During that time, COL Marion Carl, USMC, CDR Turner Caldwell, USN, and LCDR Hugh Wood, USN, made several evaluation flights for the Navy. LCDR Wood was assigned as the BuAer Project Officer on the XA2D-1.

On 19 December 1950, LCDR Wood took the XA2D-1 up for his second flight in the aircraft and the seventh for the Navy. Two dives were made, one from 30,000 ft. and another from 20,000 ft., with 5G pullouts. Following the second dive, George Jansen, Bill Bridgeman, and others in a mobile unit on the lakebed noticed a

Below, 122988 in flight from below, showing the original inner wing fuselage pylons which were replaced by forward swept ones on all subsequent Skysharks. (MFR)

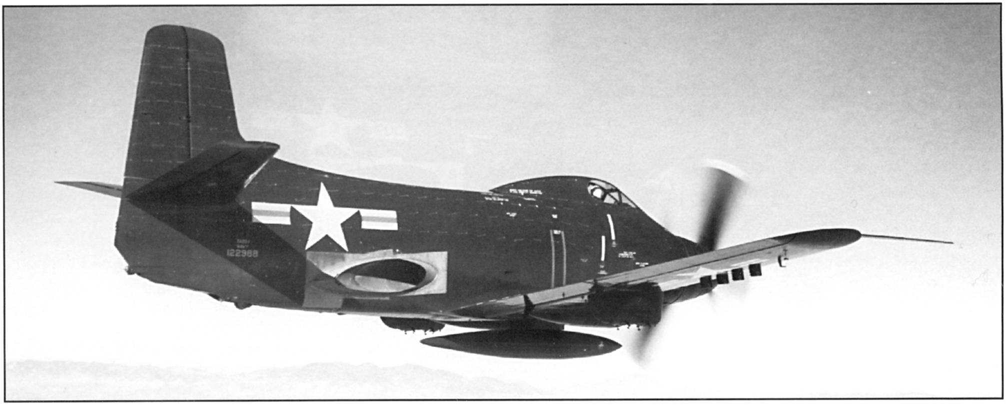






puff of smoke or vapor coming from the aircraft, which disappeared when the dive brake closed. LCDR Wood

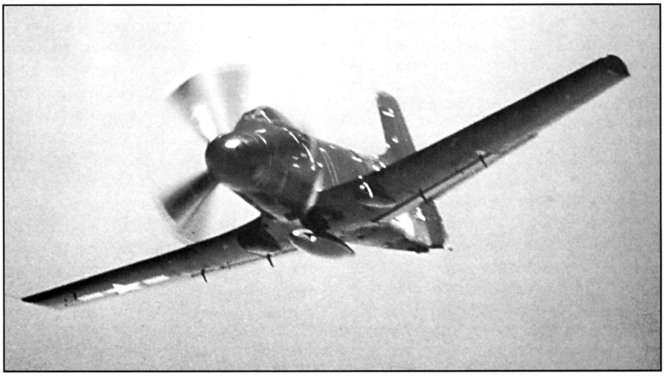
On this page, tufting is seen on the upper fuselage and tail of XA2D-1 122988 during an October 1950 test flight. The aircraft was characterized by its original short tail and unique protruding exhaust cone. At right top, the Skyshark cruises over the lakebed on 20 October 1950 after a four month stay due to severe engine vibration problems. At right middle, 122988 makes a high speed pass over the lakebed; note the pylons have been removed. On 8 December 1950, a top speed of 500 mph was reached. Below right, 122988 landing on the lakebed. Note the large tail wheel structure. (MFR & via Gerry Markgraf)

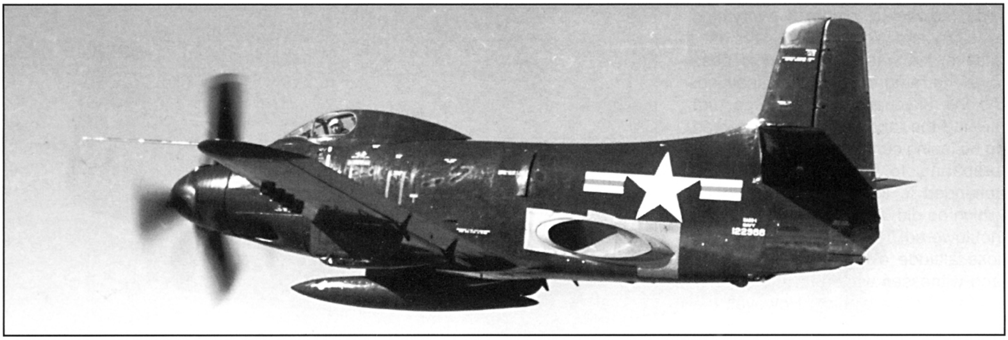


was radioed to inquire if everything was OK, and Wood replied in the affirmative. He was then asked to pass over the ramp for a visual inspection. As the Skyshark made a large turn around the lakebed, it was observed to be losing considerable altitude as if preparing to land. The pilot was reminded to lower his landing gear, which he did, although the flaps were not lowered. The aircraft continued to lose altitude at a considerable rate, and witnesses waited for the expected flare before landing. However, the aircraft did not flare and impacted on the lakebed several miles from the mobile unit. The Skyshark was in a level attitude when it struck the ground, but it hit at an estimated angle of 30° and a velocity of approximately 90 ft. per sec. This was many times the landing gear vertical design velocity and the gear sheared off. The aircraft slid several hundred yards and burned. Tragically, LCDR Hugh Wood lost his life in the accident.

Subsequent examination of the wreckage revealed that the right power section of the XT40-A-2 had apparently quit due to failure of several stages of the turbine. Normally, this situation would not have been too serious as the offending power section could have been declutched and the aircraft was easily able to fly with the power developed by one side of the XT-40. Unfortunately, the right power section was not declutched nor were the propellers feathered. It was later calculated that approximately 4,000 HP would be required to drive the failed right hand section through the gearbox. This was far in excess of the output of the operating left section. To maintain the scheduled engine speed required, the propellers would have moved into low pitch, resulting in very high aircraft drag and washout of much of the wing's lift. The final result was the high rate of decent and impact on the lakebed. The aircraft had accumulated 19.35 flying hours and was on its 23rd flight.

It was not understood why the pilot had failed to declutch the right power section unless he was unaware that the engine had failed or unsure as to which power section had



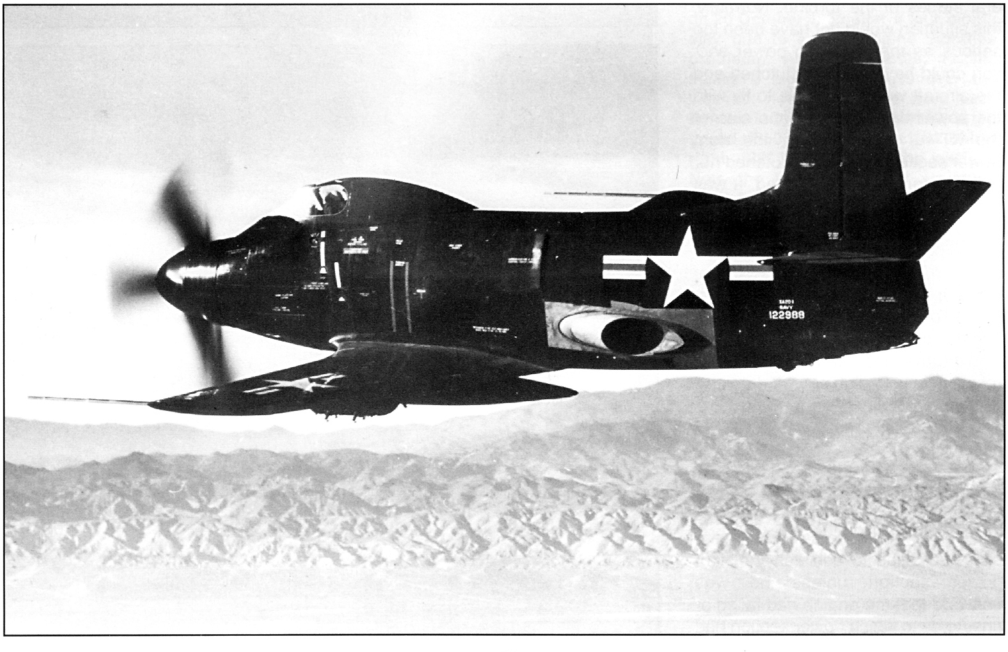


Above, XA2D-1 122988 over the Mojave desert prior to the addition of the lengthened vertical fin and the redesigned jet exhaust. Compare this photo with the others on page 48 & page 49. (MFR)

quit. Cockpit loss-of-power indicators were added on XT40-A powered aircraft by including temperature gages in the aft end of each engine as well as a torquemeter in the shafting. A more positive fix was planned by the addition of an automatic decoupler to separate individual power sections from the propellers in the event of a failure. However, development of the automatic decoupling devices would add even more difficulties and delays to the XT40-A and A2D-1 programs.

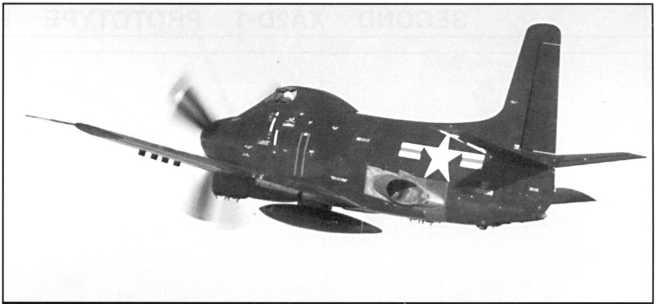
Loss of the prototype Skyshark left George Jansen without an aircraft for flight test. While Jansen awaited the completion of the second aircraft, he made good use of his time by flying the Boeing P2B-1S (a Navy B-29, BuAer no. 84029) launch aircraft, affectionately known as "Fertile Mertile", for Bill Bridgeman's series of record breaking flights in the D-558-2 Skyrocket.

The second prototype Skyshark (BuAer 122989) was nearly complete when the first prototype was lost, and a first flight date was planned for February 1951, but again, a series of powerplant failures, engine changes, and revisions continued to delay the first flight of the aircraft. BuAer

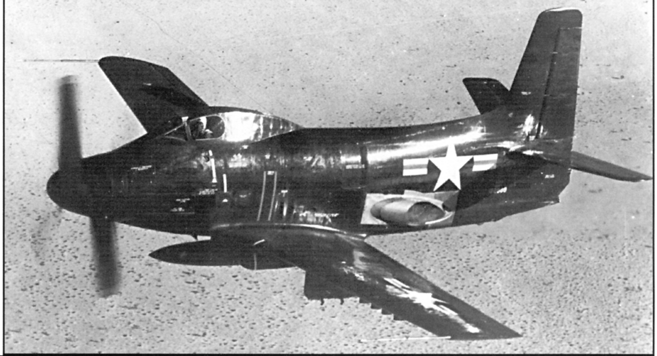


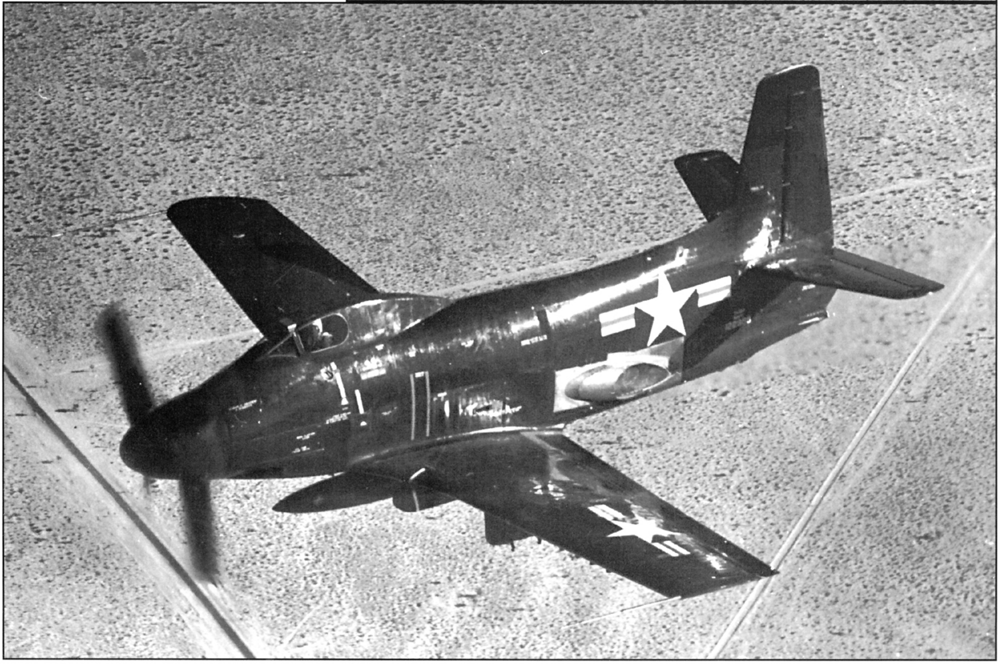
122989 made a series of taxi tests and lift-offs on the long runway at the Hughes Aircraft Co. plant in nearby Culver City during June of 1951, but the first extended flight of the aircraft, at Edwards AFB, was not accomplished until 3 April 1952. George Jansen was again at the controls for the 35 minute flight.

The new Skyshark prototype differed in a few details from its predecessor, most noticeable of which was the flush jet orifice on the fuselage sides in lieu of the earlier protruding exhausts. It also received a production configuration fin and rudder during its long wait to be flown. The second prototype also had lost its earlier blue-black paint for a bare metal finish. An important internal change was

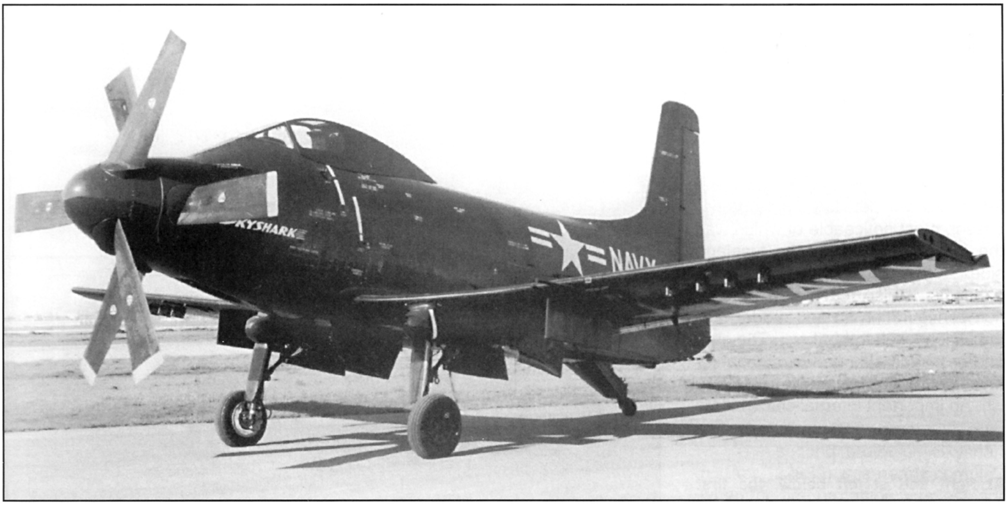


At right and at left below, the first XA2D-1 as it was configured when it was lost with its Navy test pilot LCDR Hugh Wood on 19 December 1950. Note the shape and bulk of the prototype's canopy in these photos. (MFR)





SECOND XA2D-1 PROTOTYPE BuNo.122989

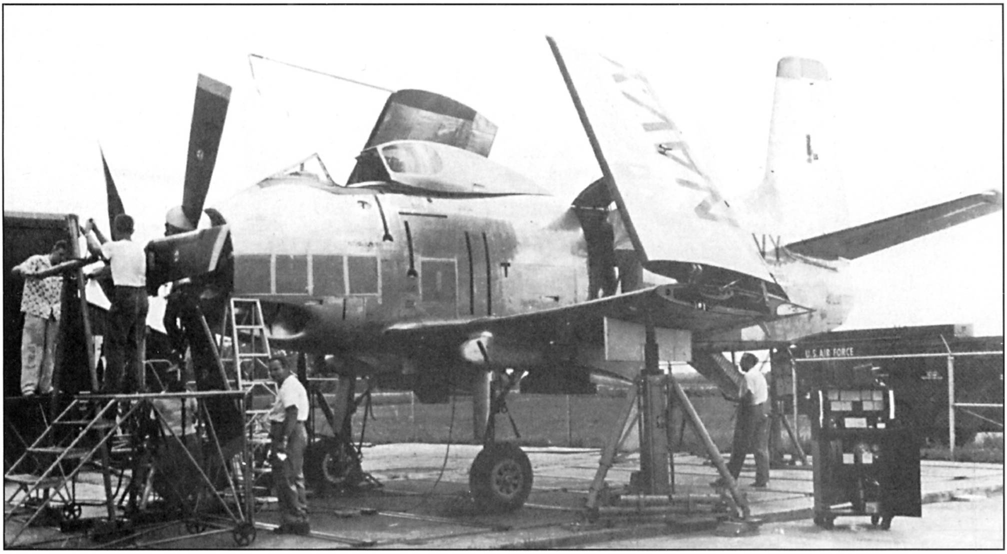


Above, the second XA2D-1 prototype 122989 shortly after rollout. Note missing wingtips, thinner main wing pylon and *SKYSHARK* painted on the forward fuselage. (MFR)

inclusion of the new automatic decoupling device.

Flight testing of the number 2 ship continued with a second flight lasting 45 minutes, and as 122989 accumulated flight time throughout 1952, it became apparent that the powerplant was still a major source of problems. A failure of the propeller forward thrust bearing on flight number 14 in August 1952 necessitated another engine change, and the aircraft was trucked back to El Segundo for installation of the new YT40-A-6A, a configuration that represented the powerplant planned for the production A2Ds. However, the continued failures, especially those involving the main reduction gearing, bode ill for the Skyshark's future.

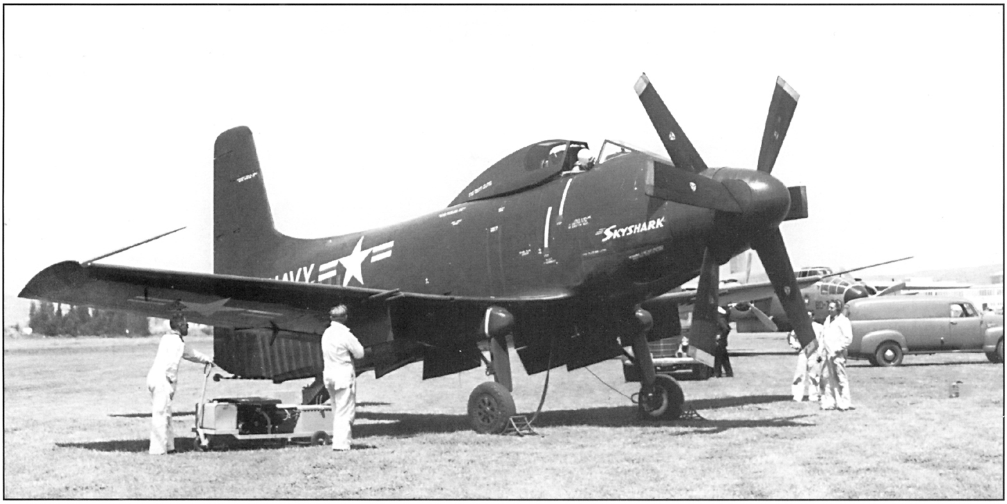
Meanwhile, Ed Heinemann had

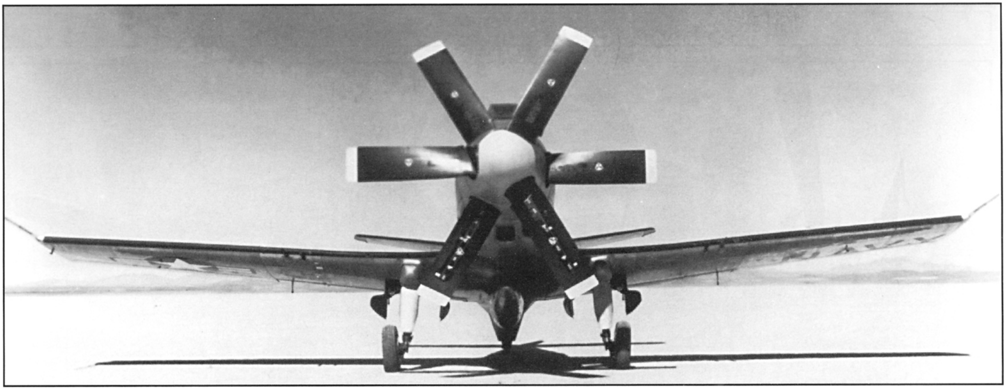


Above, the number two XA2D-1 during engine rework prior to the first flight, after the original blue paint had been stripped off.

already become concerned about the tendency of the newer designs to become increasingly larger and more complex and, in the early '50s, he and his design staff set themselves to the task of designing a comparatively light and simple fighter design which was presented to the Navy in early 1952. The new fighter was rejected by the Navy, but Heinemann was encouraged and, as the Navy still had an urgent requirement for a turbine powered attack plane which the A2D had not yet fulfilled, a new attack aircraft using the same lightweight concepts was proposed. The Navy was able to consider a pure jet, carrier-

Below and at left bottom, the number two XA2D-1 122989 during taxi tests at Hughes Aircraft's runway in Culver City, California, on 5-28-51. (via Craig Kaston)



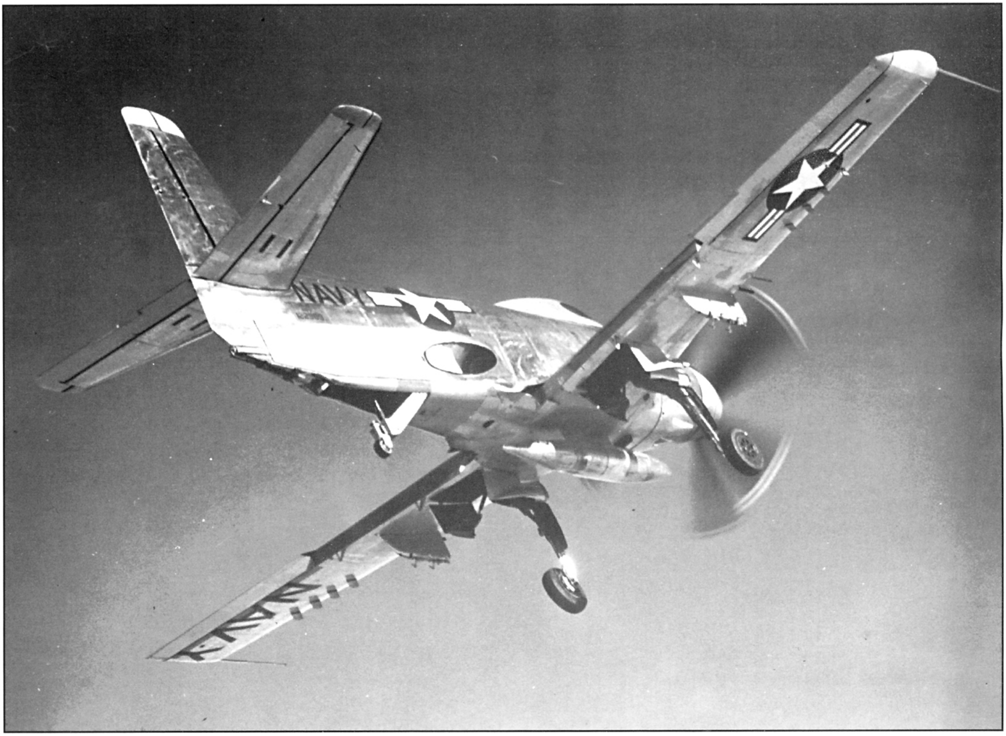


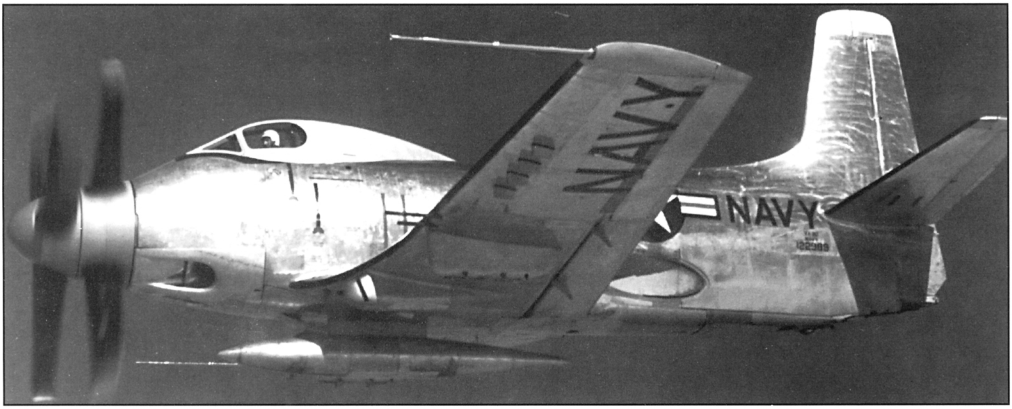
Above, head-on view of the silver XA2D-1 at Edwards. The propeller nose cone was beige fiberglass as production aircraft were to be fitted with nose radar. (via Kaston)

based attack plane with considerable more confidence than in 1945, as the operational use of jet carrier aircraft in the Korean conflict was proving the feasibility of using the turbojet aboard aircraft carriers.

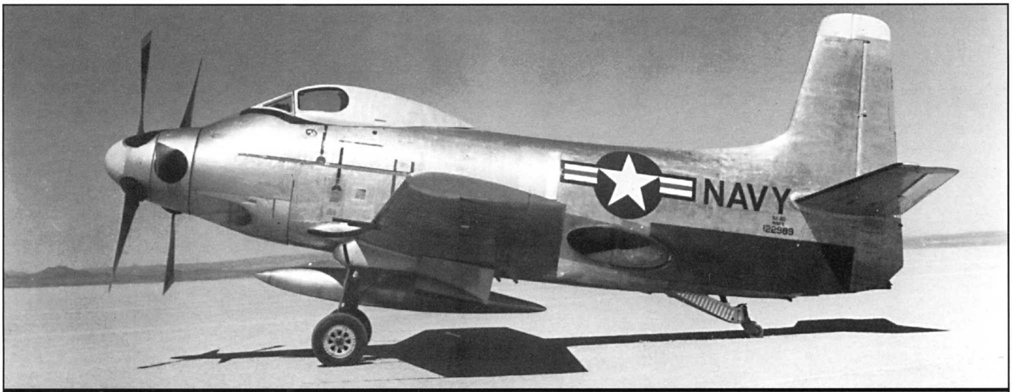
Douglas received a letter of intent to contract 52-1071 on 21 June 1952 to build one prototype of "a light-

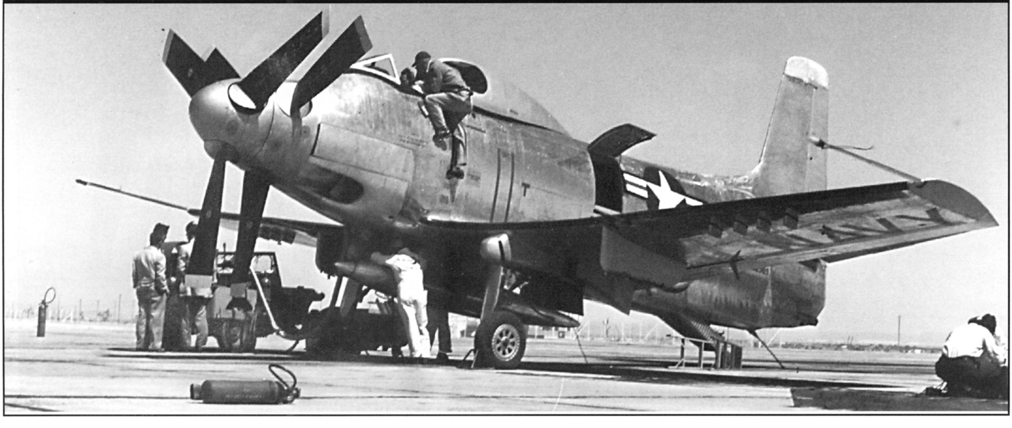
Below, 122989 landing at Edwards. The main gear legs retained their original blue paint. (via Kaston)

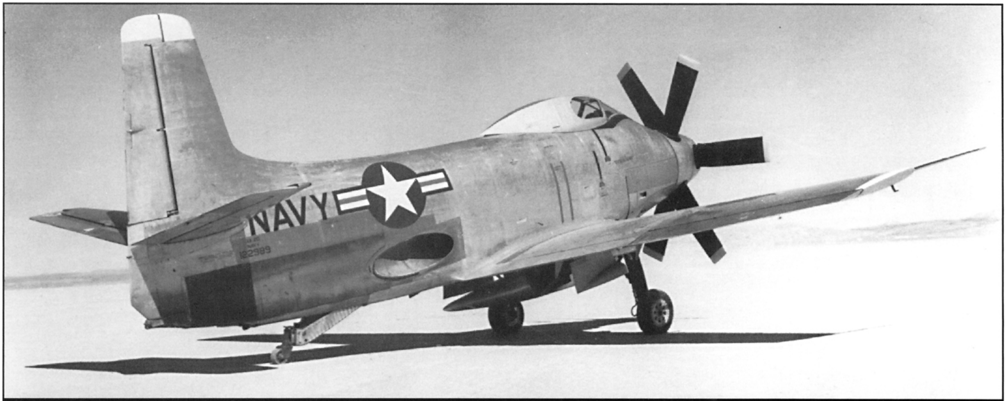


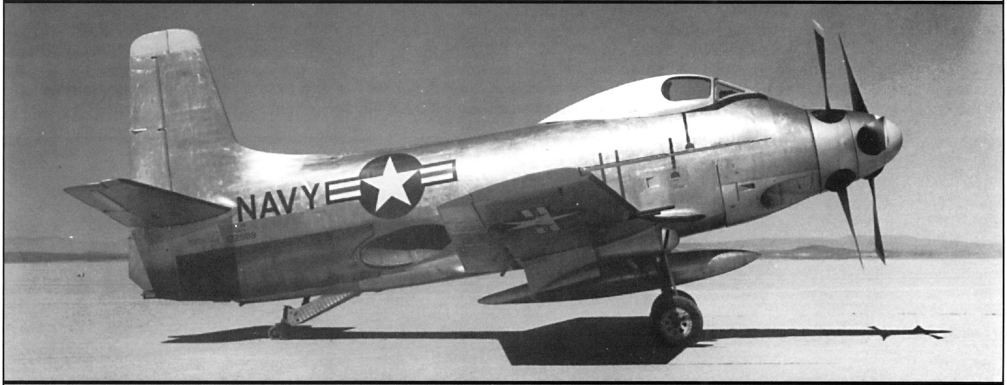


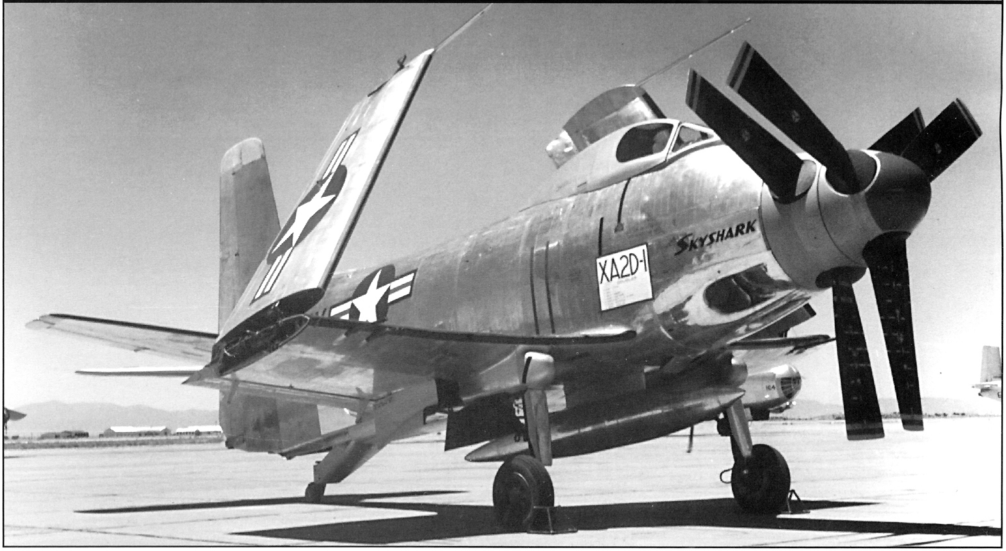
Above, 122989 in flight with the fat weapons pylons re-installed. Note massive size of the prototype canopy. (MFR) Below, left side view of the 2nd prototype XA2D-1; note the new flush exhaust ports on the aft fuselage. (via Craig Kaston) Bottom, Douglas mechanics work on the 2nd Skyshark on the ramp at Edwards. The engine work platform door above the engine intakes is partially open. The open fuselage door is the access to the radio compartment. Note mechanic demonstrating usage of the cockpit access steps and position of the massive open canopy. (NASA via Craig Kaston)






NAVY
122989


NAVY
122989


SKYSHARK
XA2D-1

At left top and middle, right side views of 122989 on the lake bed at Edwards with the wing pylons removed. (via Gerry Markgraf)

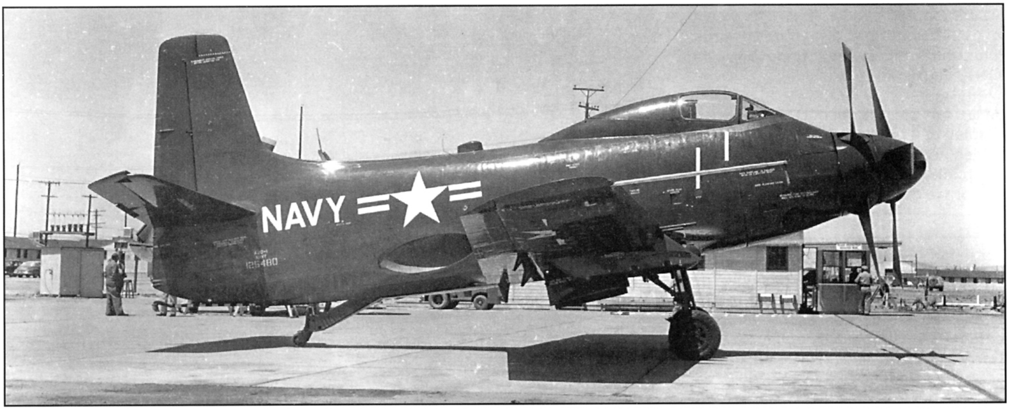
At left bottom, the second Skyshark on display at a later date with *SKYSHARK* added to the forward fuselage. Note simplicity of the wing fold. (Norm Taylor via Craig Kaston)

At right, Ed Heinemann, designer of the A2D as well as all of Douglas' highly successful carrier based aircraft, confers with Donald Douglas Sr. (via Gerry Markgraf)

weight, single engine, single place, high performance, carrier based, day attack landplane capable of performing dive bombing, interdiction, and close support missions." The new aircraft would also be "capable of delivering conventional or special weapons and intended to be capable of striking sea and land targets with or without fighter escort where control of the air had not been established." Their first A-4 Skyhawk prototype (BuAer 137812) was purchased with research and development funds under terms of the contact given Douglas.

Early in 1952, CDR Angus Jacks was assigned as BuAer's Project Officer for the A2D and A2J aircraft,

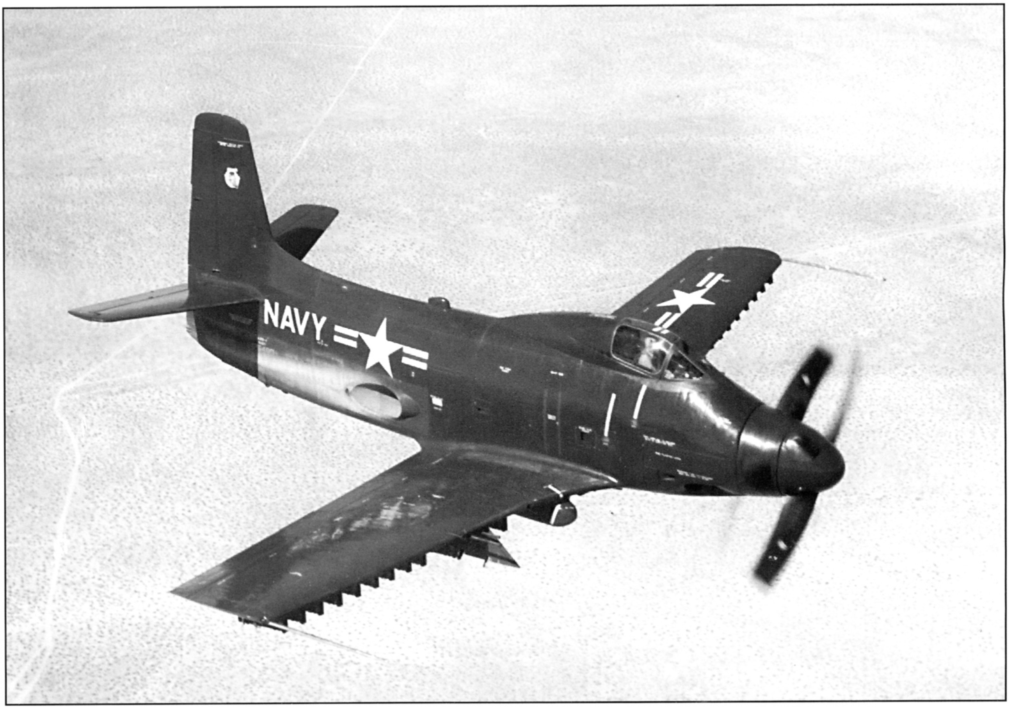
Below, El Segundo Division Test Pilots gathered for a 1955 group photo. G. C. "Doc" Livingston (third from right) and Bob LeSuer (kneeling) were both associated with the A2D flight test program. (via Gerry Markgraf)

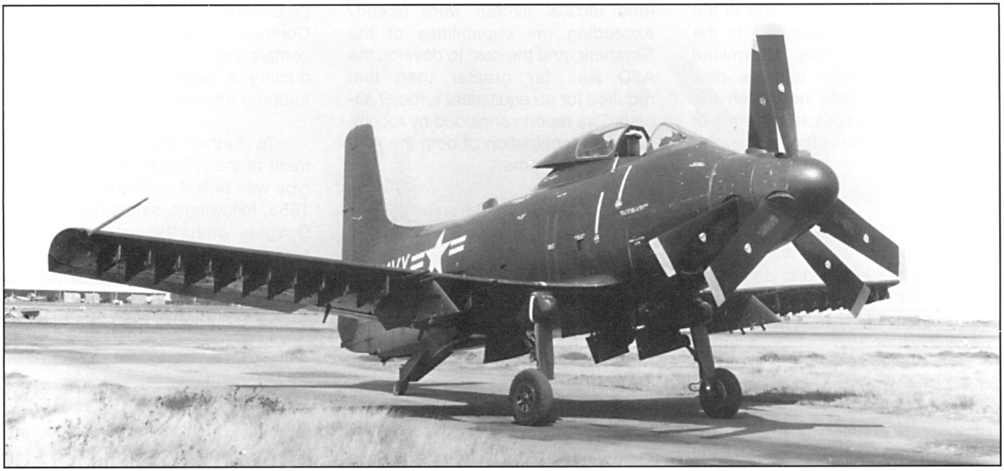


Above, the first production A2D-1, 125480, shortly after rollout on 9-15-53. Aircraft has flush exhausts, smaller sliding canopy and forward swept wing pylons like those used on the Skyraider. (National Archives)

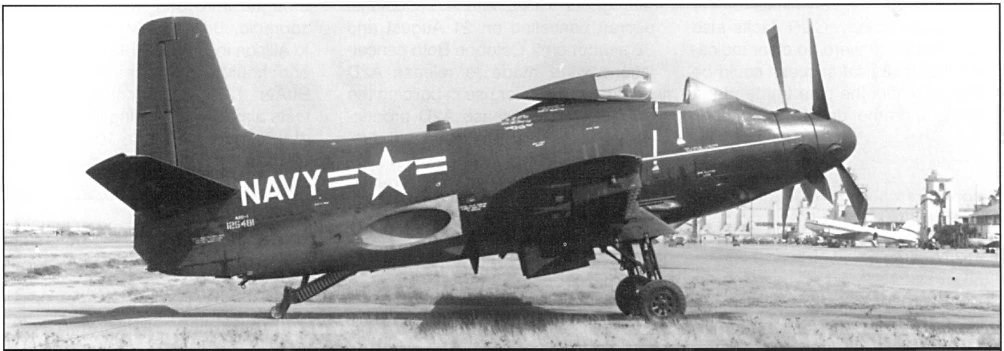
reporting to CDR John Brown, head of the Bureau's Attack Class Desk Offices. CDR Jacks had his work cut out for him as both the A2D and the A2J were mired in development difficulties, primarily centered around their common powerplant, the XT40-A. CDR Jacks had previously been assigned to a Navy Attack Squadron which had suffered considerable trou-

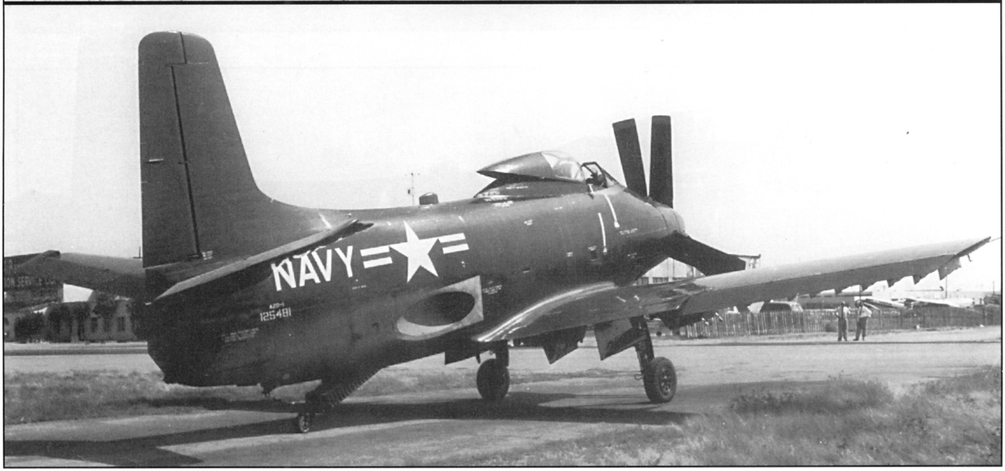
Below, the first production aircraft, 125480, during test flight with the Douglas Flight Test Division Insignia on the fin tip. Note the original flush exhaust has been replaced. (MFR)





Three views of the second production A2D-1, 125481, on 9-18-53; note size, shape and position of open production canopy.





bles while introducing the first of the AJ-1 Savage attack bombers to the fleet. CDR Jacks was determined after this experience that his new responsibilities would not reach the fleet until they had reached a state of operational readiness that would preclude difficulties of the sort he had experienced in his old squadron.

One of CDR Jacks' first actions was to visit all of the contractors and subcontractors involved to determine the major problems and their proposed solutions. The trip took three weeks, and the heart of CDR Jacks' subsequent report concerned two days spent at Allison discussing the gear box failures. The report pointed out that the metallurgy involved in producing the gear box, particularly the large "bull gear" which received the power output of both power sections, was at the very limits of the existing technology. CDR Jacks also noted that there were no clear indications that technical success could be achieved within the time frame of the existing airframe designs. Jet powered tactical aircraft were already exceeding the capabilities of the Skyshark, and the cost to develop the A2D was far greater than that required for an equivalent turbojet aircraft. The report concluded by recommending termination of both the A2D and A2J programs.

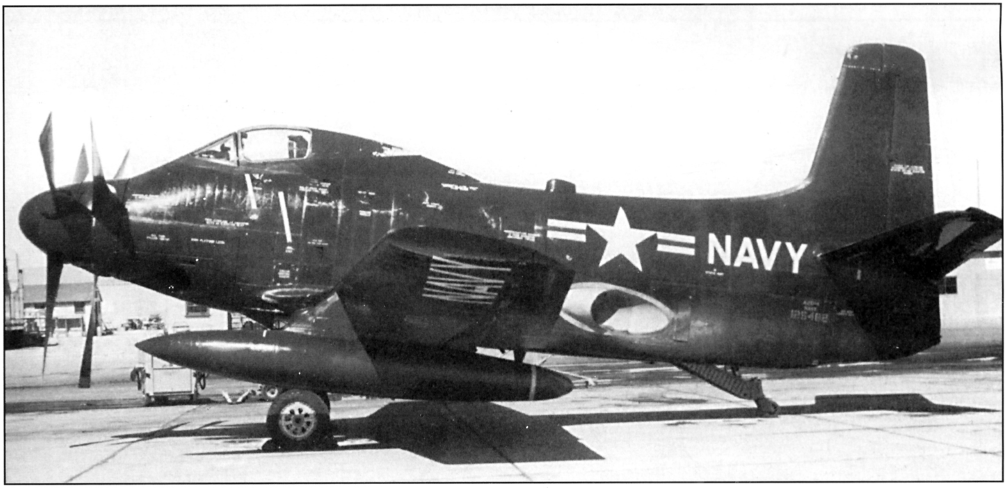
The Bureau of Aeronautics was coming to the same conclusions and, starting on 11 February 1952, a partial termination of production A2D contracts was begun. Each cancellation was a response to some new setback in engine/airframe development which required rescheduling of early production aircraft deliveries. For instance, the first cancellation occurred after a gear box failure, which further delayed the first flight of ship no. 2 by an additional two months. The cancellations continued throughout 1952, with 47 additional aircraft cancelled on 21 August and 32 aircraft on 7 October. Both cancellations were made to release A2D production lines for use in building the A3D-1, and to release A2D production funds for initiation of A4D production. The stalled A2D production lines continued to take up space required for production of more urgently needed aircraft and, on 22 September, final cancellations of 190 A2Ds were made to release production space for the AD-6 Skyraider. A total of only 10 production A2Ds remained on Contract 12026 for the purpose of completing development and conducting a tactical evaluation of a turbprop aircraft.

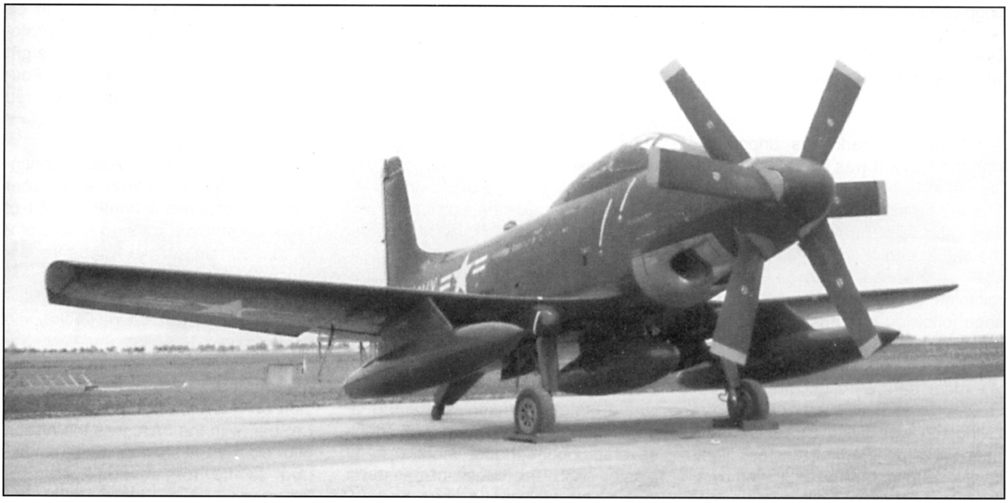
To further implement development of the XT40-A, the no. 2 prototype was bailed to Allison in late April 1953, following a single test flight by Douglas with the new YT40-A-6 engine. The aircraft flew for a time at Edwards AFB, but was ferried to Allison's facility in Indianapolis, Ind., on 7 and 8 August 1953 for continuation of flight test.

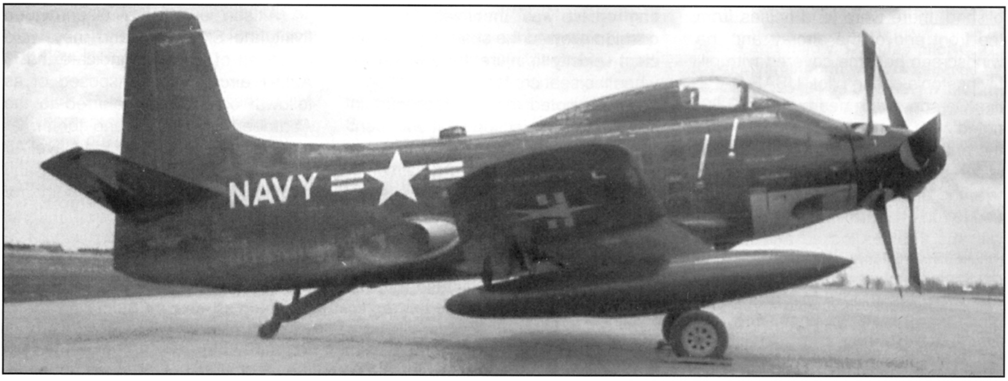
On 10 June 1953, the first production A2D-1 (BuAer 125480) made its initial flight piloted by George Jansen. Production A2Ds were completed and flown throughout 1953, including 125479, 481, 482, and 483, though deliveries were somewhat sporadic. BuAer 125482 was bailed to Allison in January 1954, following a one hour acceptance flight, to join BuAer 122989 for continued flight tests aimed at improving the reliability of the XT40. All of the 10 production A2Ds remaining on contract were

Below, the third production A2D-1 125482 in 1953. It was fitted with wing mounted auxiliary fuel tanks and has a partially faired exhaust pipe. This aircraft was bailed to Allison in 1954 along with XA2D-1 122989.

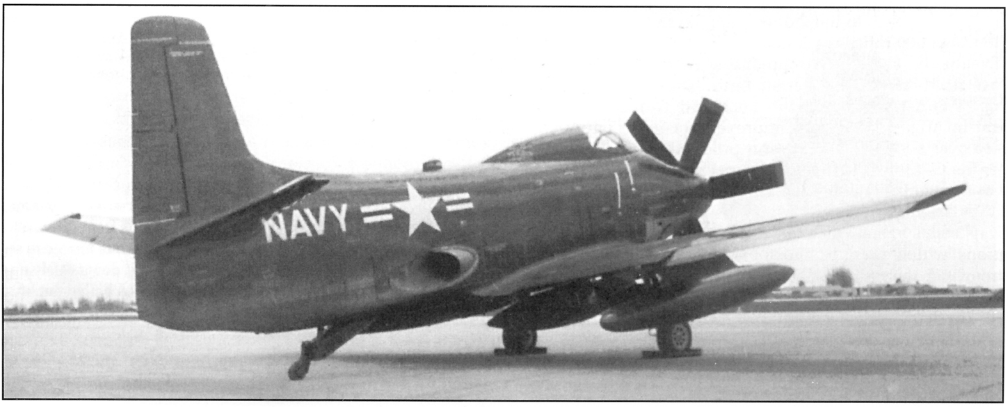
At right, three more views of the third production aircraft with wing and belly tanks attached. Note the natural metal areas around the engine intakes.







NAVY



NAVY

shop completed and awaiting production propellers in June of 1954, and Douglas continued to fly a few aircraft while the remainder were pickked up and stored.

If the Skyshark was unpopular with the Navy, it was even less popular with the pilots assigned to fly it. The poor reliability of the powerplant, combined with the pilot's position on top of that engine, did little to encourage confidence. George Jansen received a piece of gearbox in his shoe following a gearbox failure during ground tests, and there were other unexpected events. Probably the most harrowing occurred on 27 October 1953 while G. C. "Doc" Livingston was flying BuAer 125480 near Edwards. Part of the test flight involved a dive to Vmax followed by a modest (1.5g to 2g) pullout and a roll. As this maneuver was being accomplished, there were loud noises from the front end of the aircraft and the windscreen became covered with oil. Livingston's chase pilot, USAF CAPT Jim Carson, flying nearby in an F-86, noted with some astonishment that the entire propeller and nose section of the gear box had parted company with the aircraft. The engines continued to run at approximately 1/3 power with the throttles locked and, as the canopy refused to open more than a few inches, Livingston was unable to bail out. Fortunately, Livingston found that the aircraft was controllable, though vision was restricted by the oil on the windshield. Aided by directions from his chase pilot, Livingston was able to bring the aircraft to a safe landing on the lakebed, squeeze through the small canopy opening and jump off the wing as the aircraft trundled on across the lakebed propelled by the residual thrust of the still-running engines. BuAer 125480 was subsequently repaired and returned to flight status.

Indications were strong that the propeller and gear box had separated from the aircraft due to stresses placed on them by insufficient ridigity between the engine and gear box mounting points in the airframe. Structural strengthening was included and flight tests resumed, but the end was near.

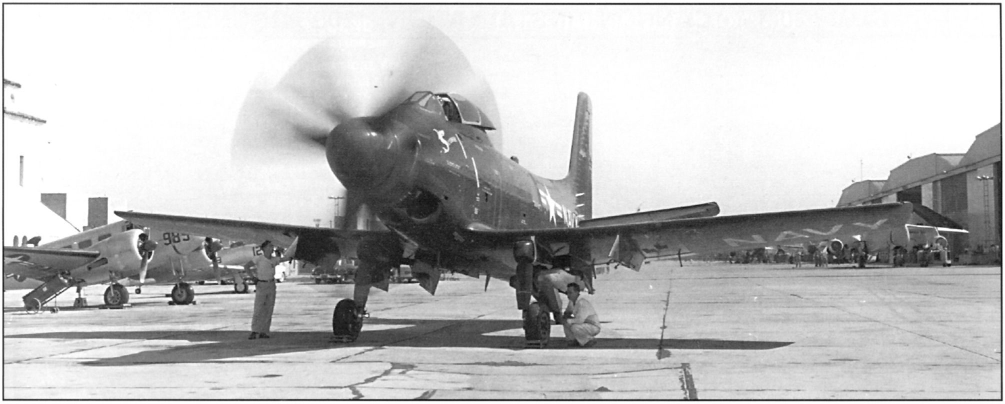
George Jensen continued his association with the Skyshark program and was flying the repaired 125480 near Edwards on 5 August 1954 when sudden gear box failure was signaled by loud noises and various cockpit indicators. As the propellers feathered, the cockpit began to fill with smoke, and, since no safe landing sites were evident, Jansen elected to eject. The first pull on the face curtain of the ejection seat produced zero results except a disconcerted pilot. A second pull produced the desired results, and pilot and seat were ejected from the aircraft. Unfortunately, Jansen sustained a back injury in the ejection and spent several uncomfortable months in a plaster cast. The cause of Jansen's injury was believed to have been a foam rubber cushion that he was sitting on. It was theorized that the cushion allowed the seat to gain sufficient velocity to injure the pilot's back when the seat contacted him. Jansen, however, noted that the face curtain handle on the ejection seat was bent out in such a manner as to indicate that he held onto the face curtain after the seat belts released. He believes that he tumbled and spun several times while holding to the seat and possibly sustained his back injury in that manner.

Apparently, the crash of 125480 was the last straw for the Navy, because the final contract for 10 aircraft was terminated on 7 September 1954 for the convenience of the government. During the spring of 1955, in compliance with the A2D termination contract, Douglas readied two last A2D-1s (BuAer 125481 and 125484) for delivery. The aircraft, which had been in storage for some time, were depreserved, updated as required and prepared for flight. BuAer 125481 was scheduled for delivery to Allison at Indianapolis, while 125484 would be sent to the Navy's storage facility at Litchfield Park, Arizona. In the event, BuAer 125484 was reassigned for the delivery to Allison and, on 16 May 1955, was flight tested and placed in flight status, ready for delivery to Allison at Edwards AFB. BuAer 125484 was the sixth A2D-1 to be flown and, along with the two prototypes, made a total of eight Skysharks that were test flown. Four additional aircraft were manufactured but were never flown.

The Skysharks at Allison continued to fly for some time, and BuAer 125482 achieved a brief moment of fame when it set a speed record of 2 hr. and 38 min. for the 1,086 mile distance between Indianapolis, Ind., and Opa Locka, Fl. The aircraft was traveling to an airshow at Opa Locka, and the power demonstrated by the Skyshark during its spectacular flying performance made a lasting impression on many of the spectators. Bob LeSuer, with the FAA, was the Allison pilot on the Skysharks, which continued to fly for several years at Indianapolis.

Allison eventually discontinued flying the Skysharks and they were disposed of. Records indicate that 3 A2D-1 aircraft were disposed of as follows: one was transferred to the Aberdeen proving ground for armament tests, one went to the Naval Air Material Center for barrier tests, and another to NAS Quonset Point for technical use. It is probable that these were the aircraft bailed to Allison. The Skysharks remaining at the Douglas plant were salvaged by Douglas.

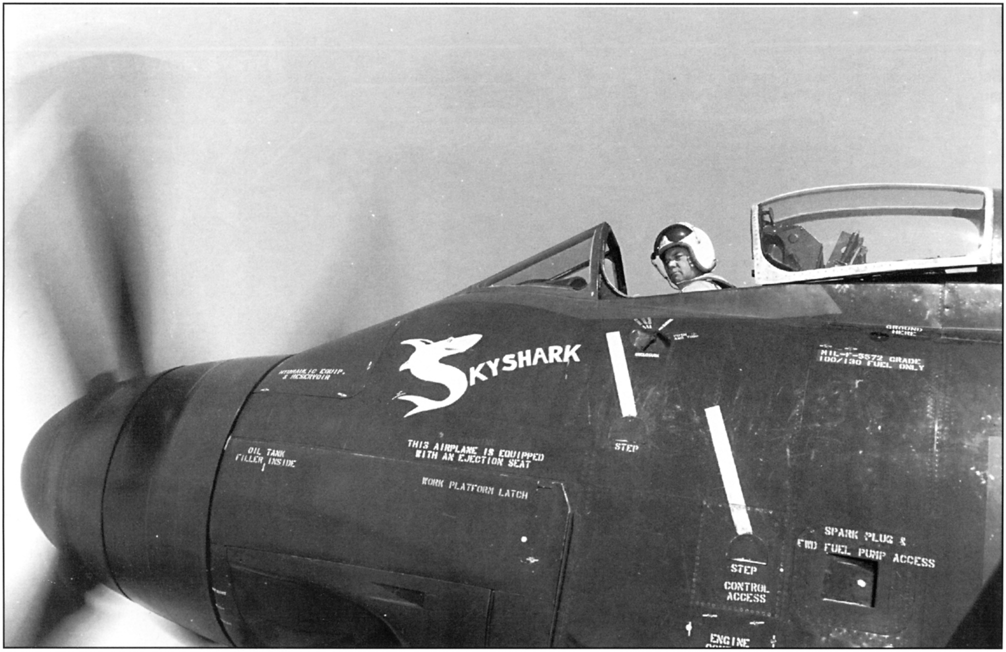
The Skyshark was an epitome of the many designs, both civil and military, that were tried and found wanting during the early efforts to fully utilize the gas turbine's potential for aviation. Regrettably, large amounts of money and resources were expended with little visible return for the investment. Perhaps even more regrettable is the sense of disappointment and loss that must have been felt by the many people who gave so much of their creativity and time to a project that was ultimately deemed a failure. LCDR Hugh Wood lost his life while flight testing the Skyshark, and it would only add to the tragedy if that talented flyer had lost his life to no purpose. However, in a larger sense, the Skyshark's contribution to aviation was great. The XT40, though not a success itself, was the parent of the



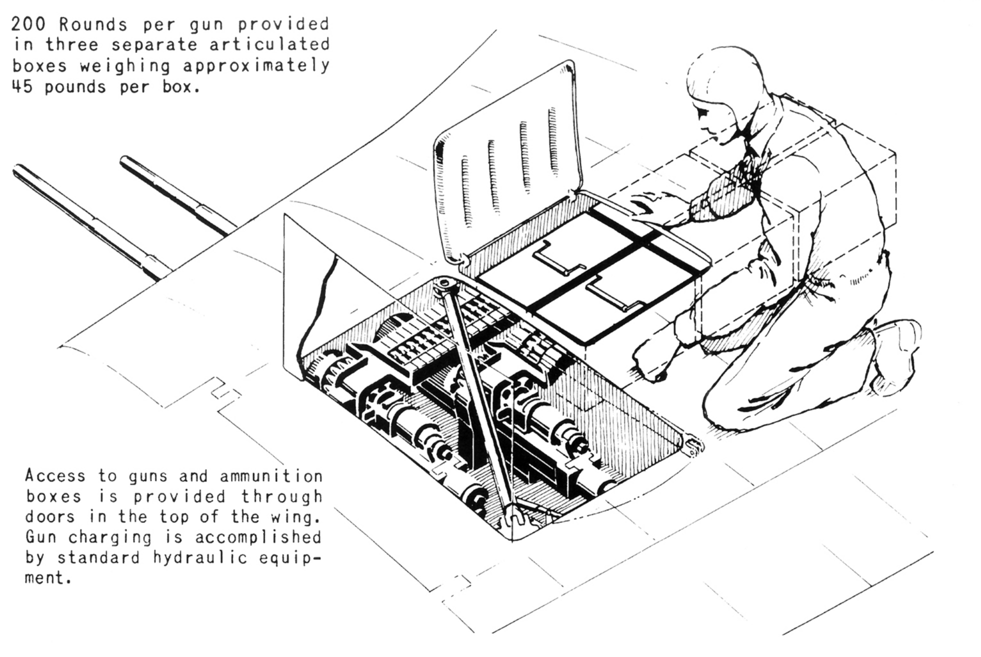
thousands of Allison turboprops utilized in the C-130, Electra, P-3, E-2, and other aircraft. Certainly every flight of these highly successful aircraft owes a debt to many hours of Skyshark flight time used for turboprop development.

The Skyshark represented a developmental dead end for its type of aircraft, a fact that would have been extremely difficult to foresee in 1945 or even 1948. Realization that the turboprop attack aircraft was more effective and less costly than the turbojet attack aircraft was costly knowledge; but Douglas engineers used their experience and knowledge to then develop the extraordinary A4D Skyhawk. Certainly, the Skyshark itself ended in failure, but the Phoenix that rose from the ashes of that project has repaid the original investment many times over.

Above and below, Douglas pilot C. G. (Doc) Livingston in what is believed to be A2D-1 125484 on 8-19-55, an aircraft that was bailed to Allison at Edwards. (via Gerry Markgraf)

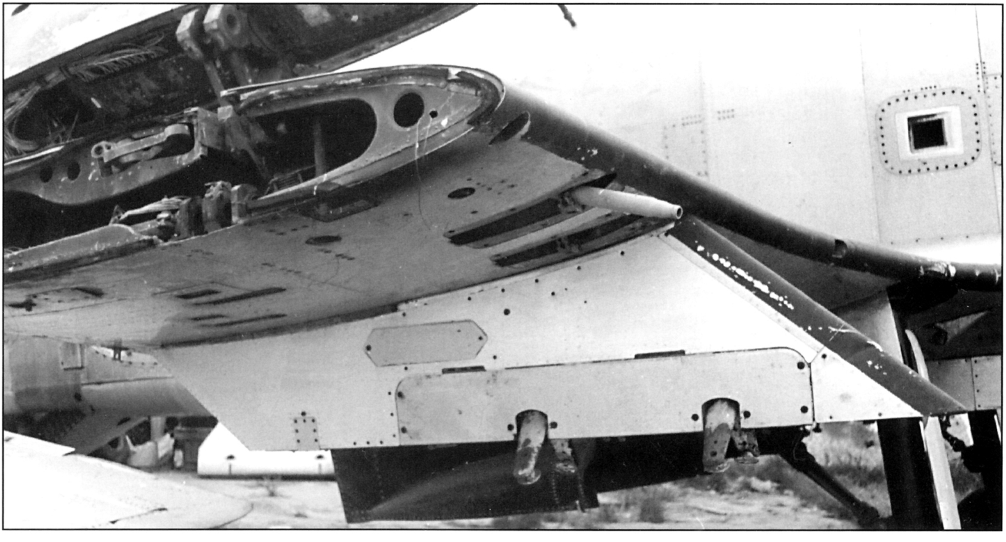

SKYSHARK
HYDRAULIC EQUIP. & RESERVOIR
THIS AIRPLANE IS EQUIPPED WITH AN EJECTION SEAT
OIL TANK FILLER INSIDE
WORK PLATFORM LATCH
STEP
GROUND HERE
MIL-F-5572 GRADE 100/130 FUEL ONLY
SPARK PLUG & FWD FUEL PUMP ACCESS
STEP
CONTROL ACCESS
ENGINE

FOUR GUN 20MM CANNON INSTALLATION, 200 ROUNDS PER GUN


200 Rounds per gun provided in three separate articulated boxes weighing approximately 45 pounds per box.

Access to guns and ammunition boxes is provided through doors in the top of the wing. Gun charging is accomplished by standard hydraulic equipment.

Below, main stores wing pylon, capable of holding one standard or high speed 250-2,000lb bomb, or one 150 or 300gal fuel tank, or one 1,700lb torpedo, or one 1,400lb incendiary cluster bomb, or one 2,000lb mine, or one 5" rocket. (Craig Kaston)



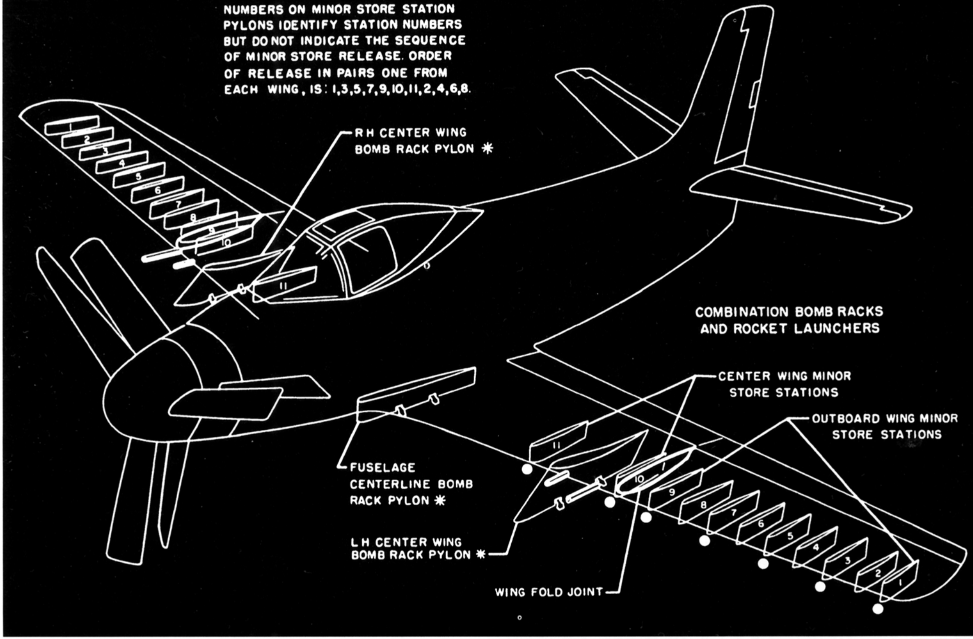
EXTERNAL STORES PROVISIONS

LEGEND

✱ MAJOR STORE STATIONS

● PREFERRED LOCATIONS FOR 500 POUND BOMBS ON MINOR STORE STATIONS (TYPICAL FOR RH AND LH WING)

NUMBERS ON MINOR STORE STATION PYLONS IDENTIFY STATION NUMBERS BUT DO NOT INDICATE THE SEQUENCE OF MINOR STORE RELEASE. ORDER OF RELEASE IN PAIRS ONE FROM EACH WING, IS: 1,3,5,7,9,10,11,2,4,6,8.


RH CENTER WING BOMB RACK PYLON ✱
COMBINATION BOMB RACKS AND ROCKET LAUNCHERS
CENTER WING MINOR STORE STATIONS
OUTBOARD WING MINOR STORE STATIONS
FUSELAGE CENTERLINE BOMB RACK PYLON ✱
LH CENTER WING BOMB RACK PYLON ✱
WING FOLD JOINT
1
2
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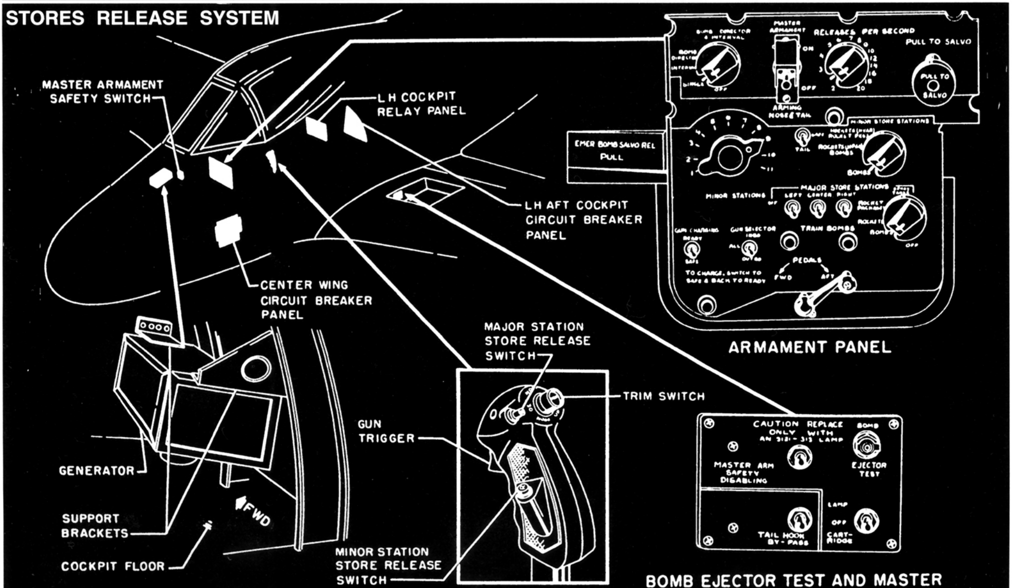
11

STORES RELEASE SYSTEM



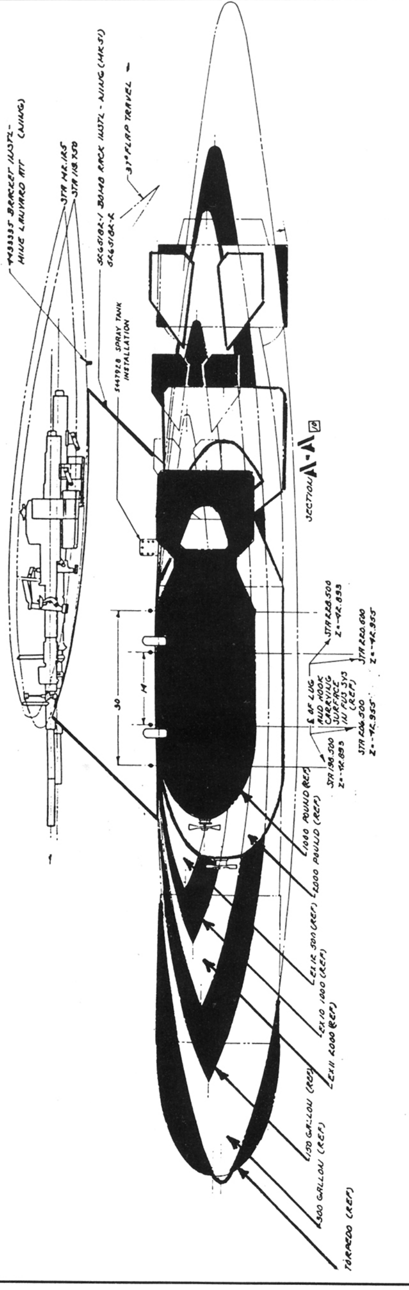
ARMAMENT PANEL

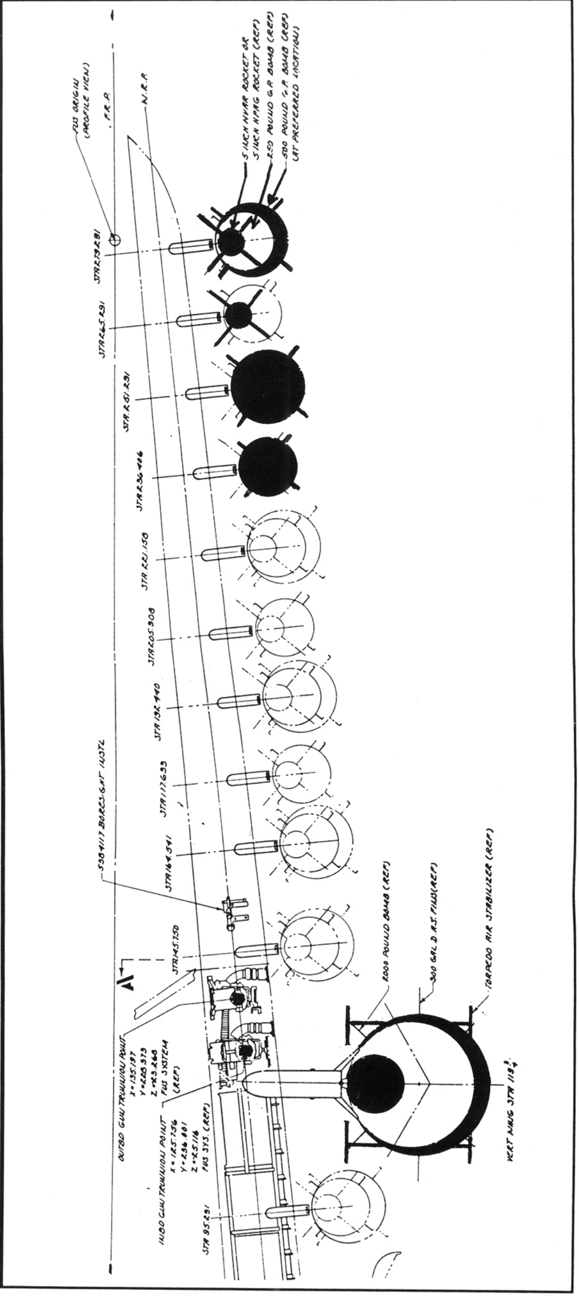
INTERVAL GENERATOR

CONTROL STICK GRIP

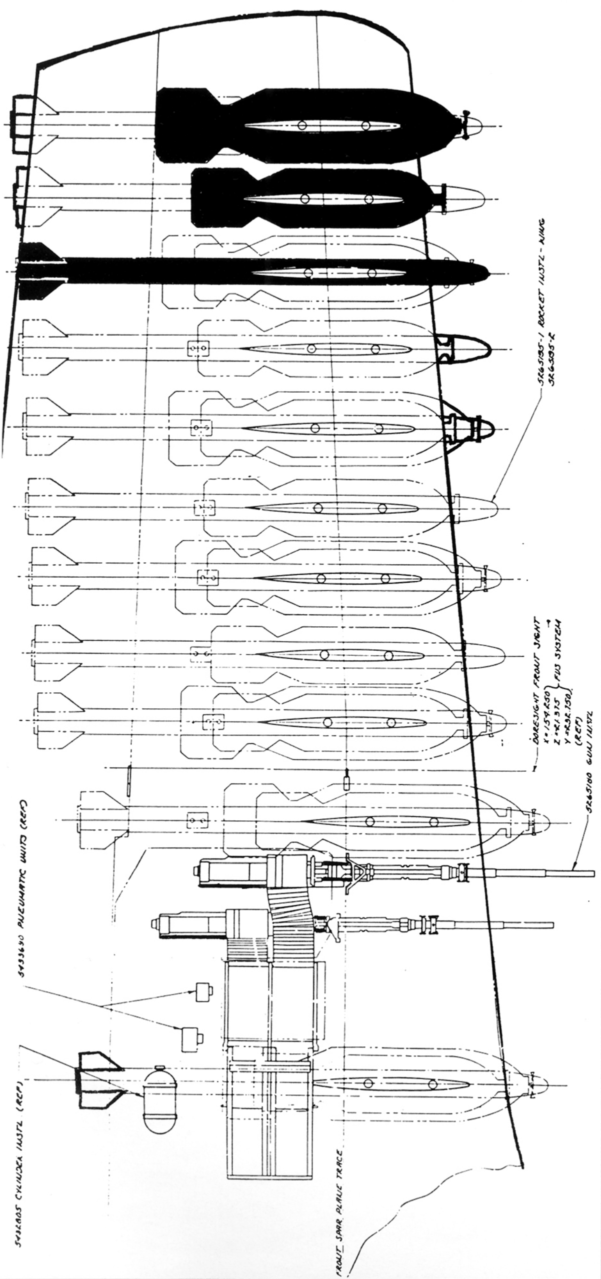
BOMB EJECTOR TEST AND MASTER ARMAMENT SAFETY DISABLING SWITCH

WING ARMAMENT LOADING DIAGRAMS

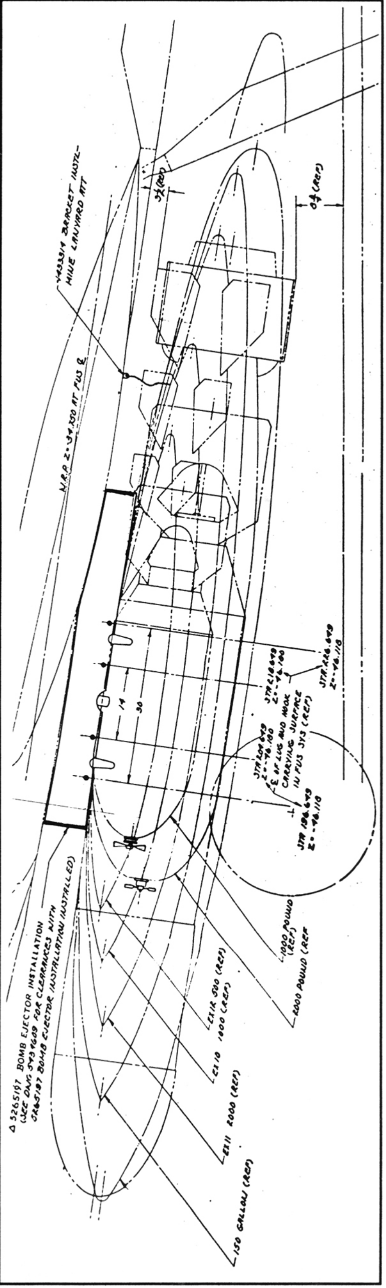



FUS ORIGIN (PROFILE VIEW)
F.R.P.
W.R.P.
5 INCH HVAR ROCKET OR 5 INCH HPAG ROCKET (REF)
250 POUND G.P. BOMB (REF)
500 POUND G.P. BOMB (REF) (AT PREFERRED LOCATION)
STR 279.291
STR 265.291
STR 251.291
STR 236.406
STR 221.158
STR 205.908
STR 192.440
STR 177.635
STR 164.541
STR 145.750
5384117 BORESIGHT INSTL
A
2000 POUND BOMB (REF)
300 GAL D.R.S. FUS (REF)
TORPEDO AIR STABILIZER (REF)
VERT WING STR 119¾
OUTBD GUN TRUNNION POINT X=135.197 Y=228.573 Z=43.268 FUS SYSTEM (REF)
INBD GUN TRUNNION POINT X=125.756 Y=236.801 Z=45.116 FUS SYS. (REF)
STR 95.291

WING ARMAMENT LOADING



FUSELAGE STORES

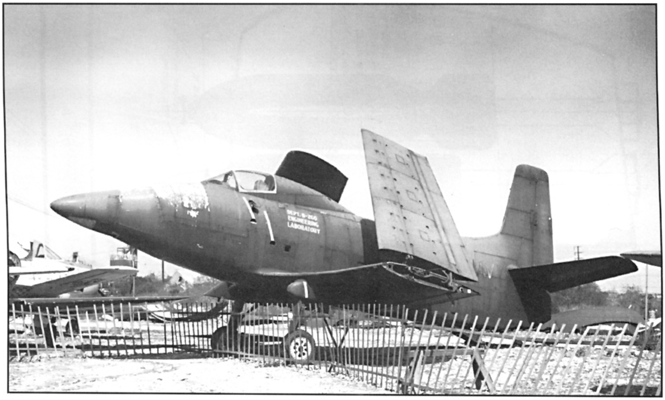


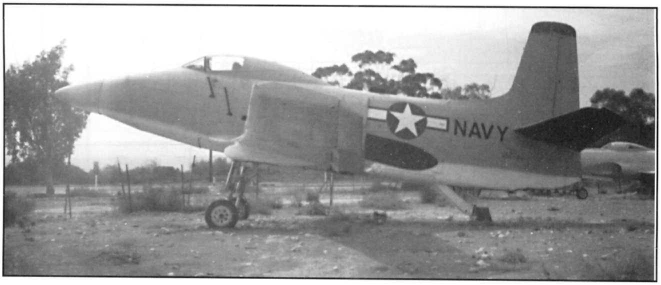
SOLE SURVIVOR, A2D-1 125485

A2D-1 125485 remained at Douglas for some time minus its powerplant. Eventually, the aircraft received a scabbed-on nose, apparently fashioned from an A-4 Skyhawk nose and was then used for ground radar calibration tests at LAX. Following these tests, the aircraft was scheduled for fire practice until Ed Maloney of the "Planes of Fame" museum intervened and, with the help of Harry Gann of Douglas, was able to obtain the Skyshark for his air museum. The A2 remained with the museum for many years until Ed sold the aircraft to Jim Nunn. On 17 December 1976, Jim resold the aircraft to John Muszala, one of the "Chino Kids" who had spent many volunteer hours working at the museum.

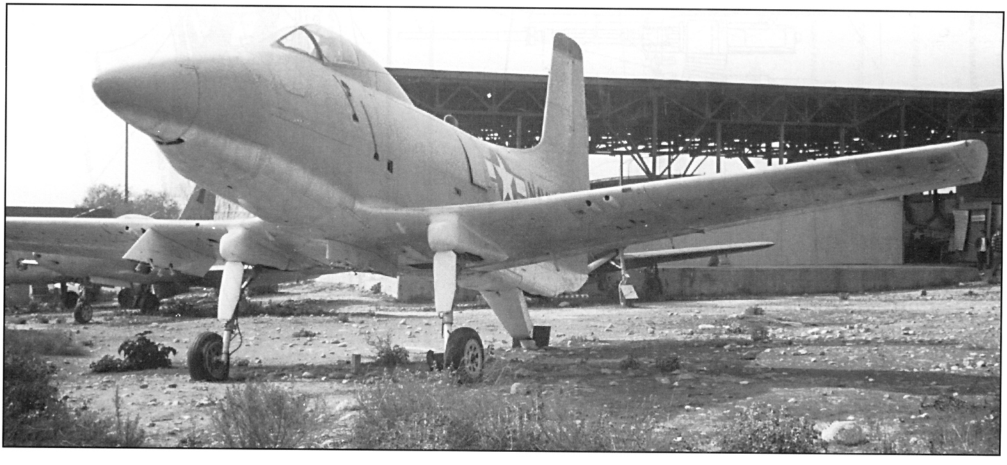
John established "Pacific Fighters", a warbird restoration firm at Chino and also became a well-known unlimited air race pilot. The A2D remained a fixture at Chino for many years, occassionally benefiting from bits of attention from "PacificFighters" craftsmen. A "really BIg" step was taken when John accidentally stumbled across a set of Aeroproducts contrarotating propellers at a junk yard in Alameda. This then inspired additional cosmetic restoration to the aircraft until its appearance was very close to original.

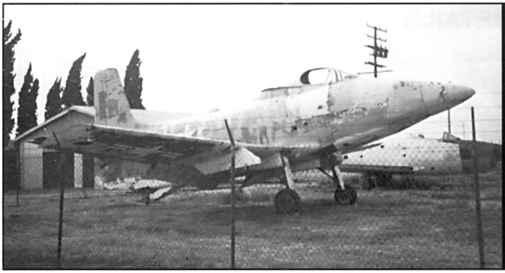
Rumors of the A2s demise in 1996 were exaggerated when John moved to Idaho Falls, Idaho. Today it's resting in a disassembled state next to John's hangar. John would like to trade it off someday, but failing that he intends to reassemble the A2D and put it on a pylon in front of his hangar which sits on a bluff overlooking interstate 15.

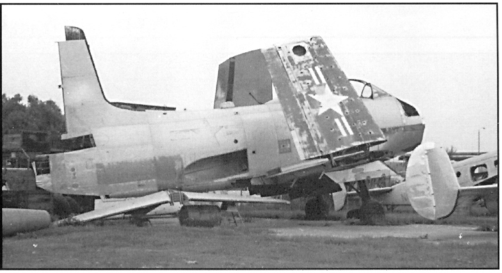




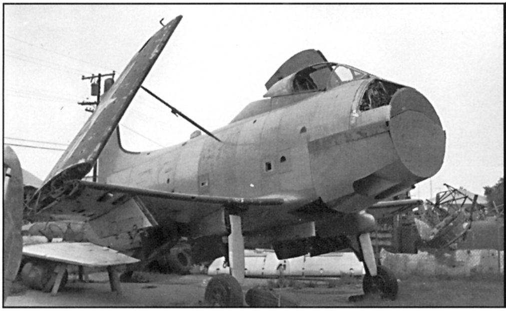
Top, A2D-1 125485 shortly after arrival at Ed Maloney's Planes Of Fame. At this point the cockpit was in good shape complete with ejection seat. Above and below, 125485 at Ontario in 1965 after being repainted in gray and white. Only the right main weapons pylon was installed. (Ginter & Markgraf)

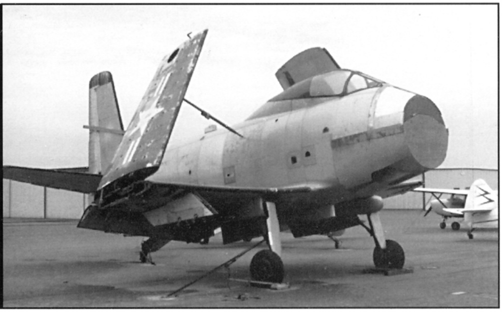




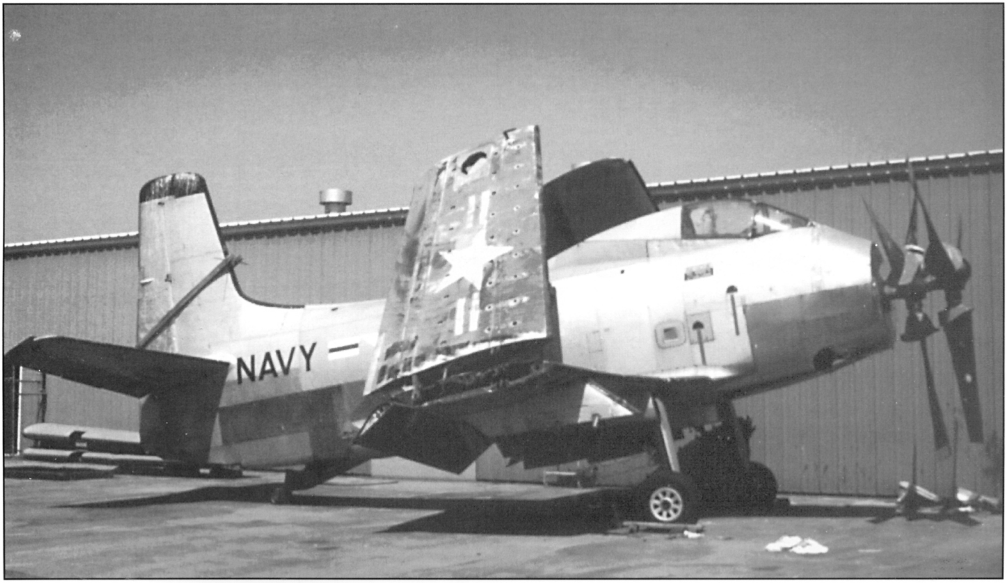


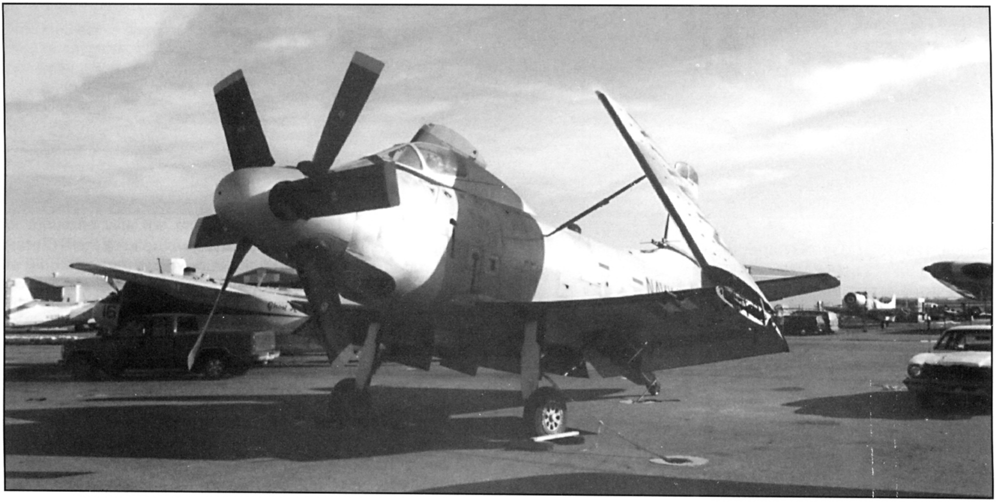
Above, 125485 in May 1977 after being vandalized in the late '60s when Jefferson Airplane was painted on the fuselage. (Ginter) Above right and below left, 125485 partially stripped down in 1981 with rudder and horizontal tail removed at the beginning of the restoration project. (Craig Kaston) Below right, in a duplicate pose as that of the photo below left, after the restoration process began. Note the restored canopy and equipment panels and the reinstalled tail group. (1985 Ginter)



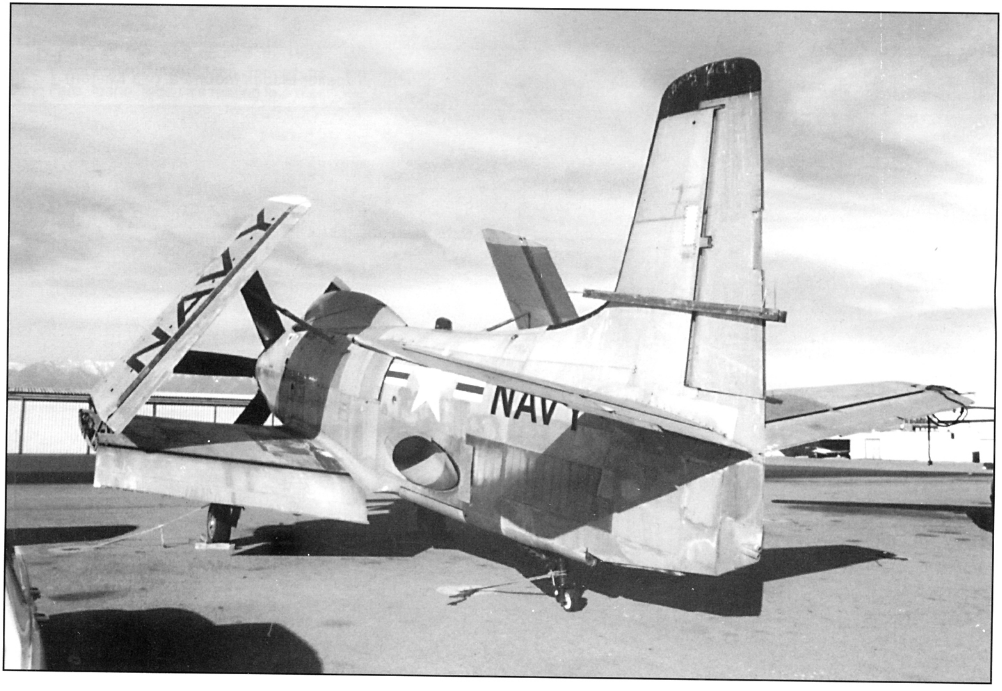


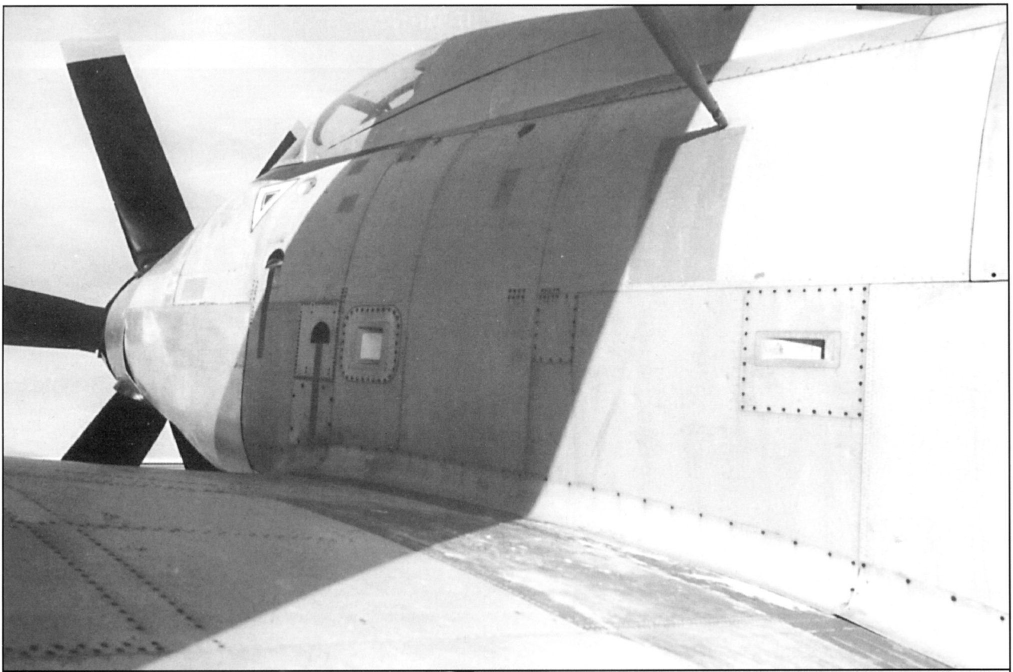
A2D-1 125485 in October 1992 with engine intake sheet metal installed and the propeller blades mounted. (via Kaston)

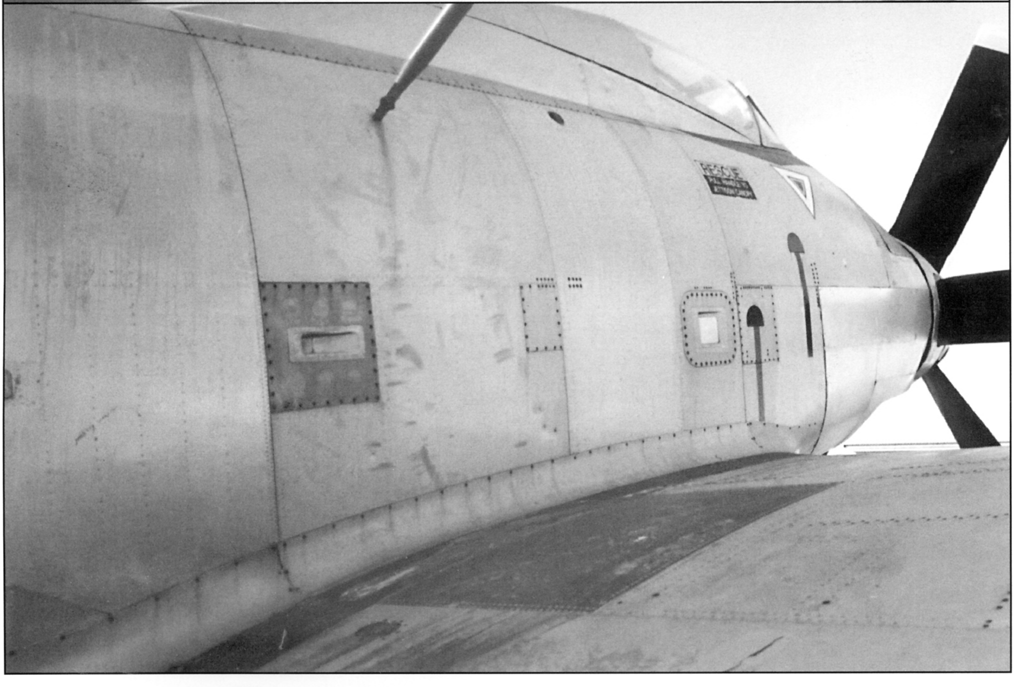




By 1995, sheet metal work for the propellers and exhausts had been completed and very little additional work was needed for static display, except for an authentic paint job. (Ginter)



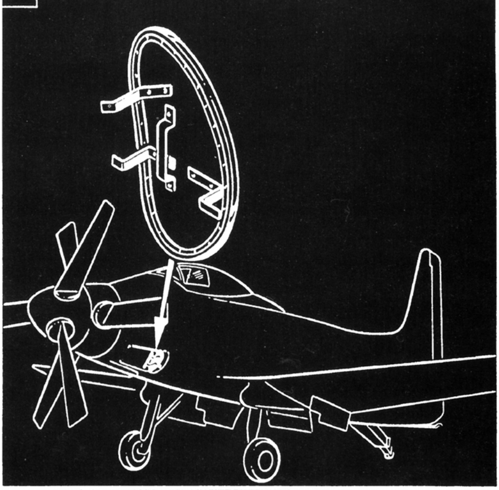




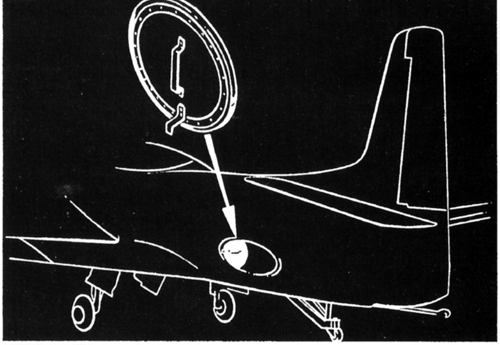
RESCUE

SPECIAL HANDLING EQUIPMENT AND TOOLS

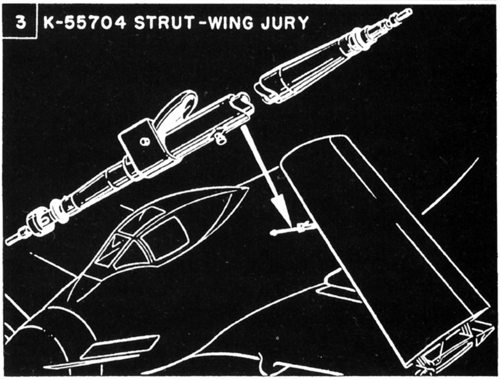
1 K-55206 COVER -AIR INDUCTION



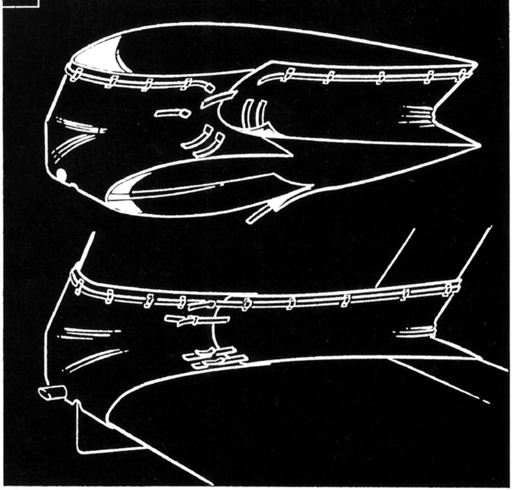
2 K-55205 COVER -ENGINE EXHAUST



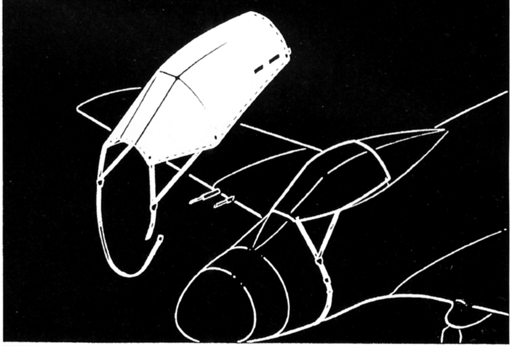
3 K-55704 STRUT-WING JURY



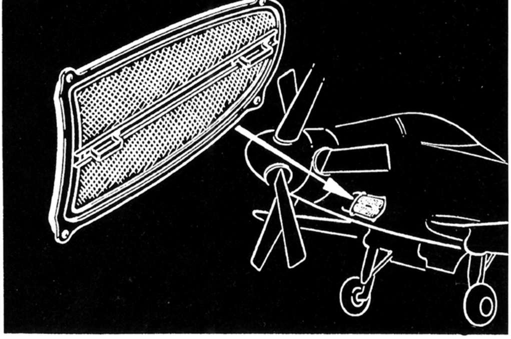
4 K-55013 COVER- WING BUTT



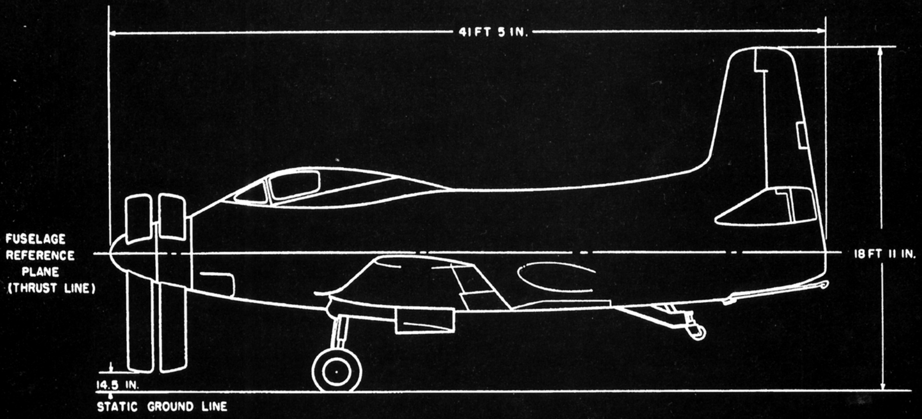
5 K-55010 COVER-COCKPIT ENCLOSURE

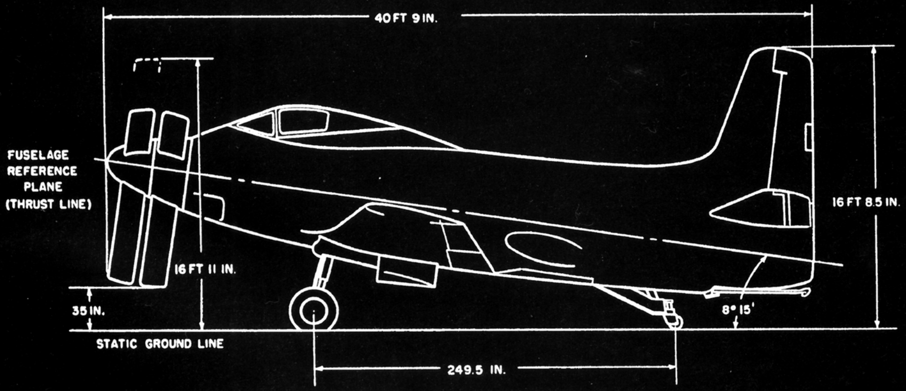


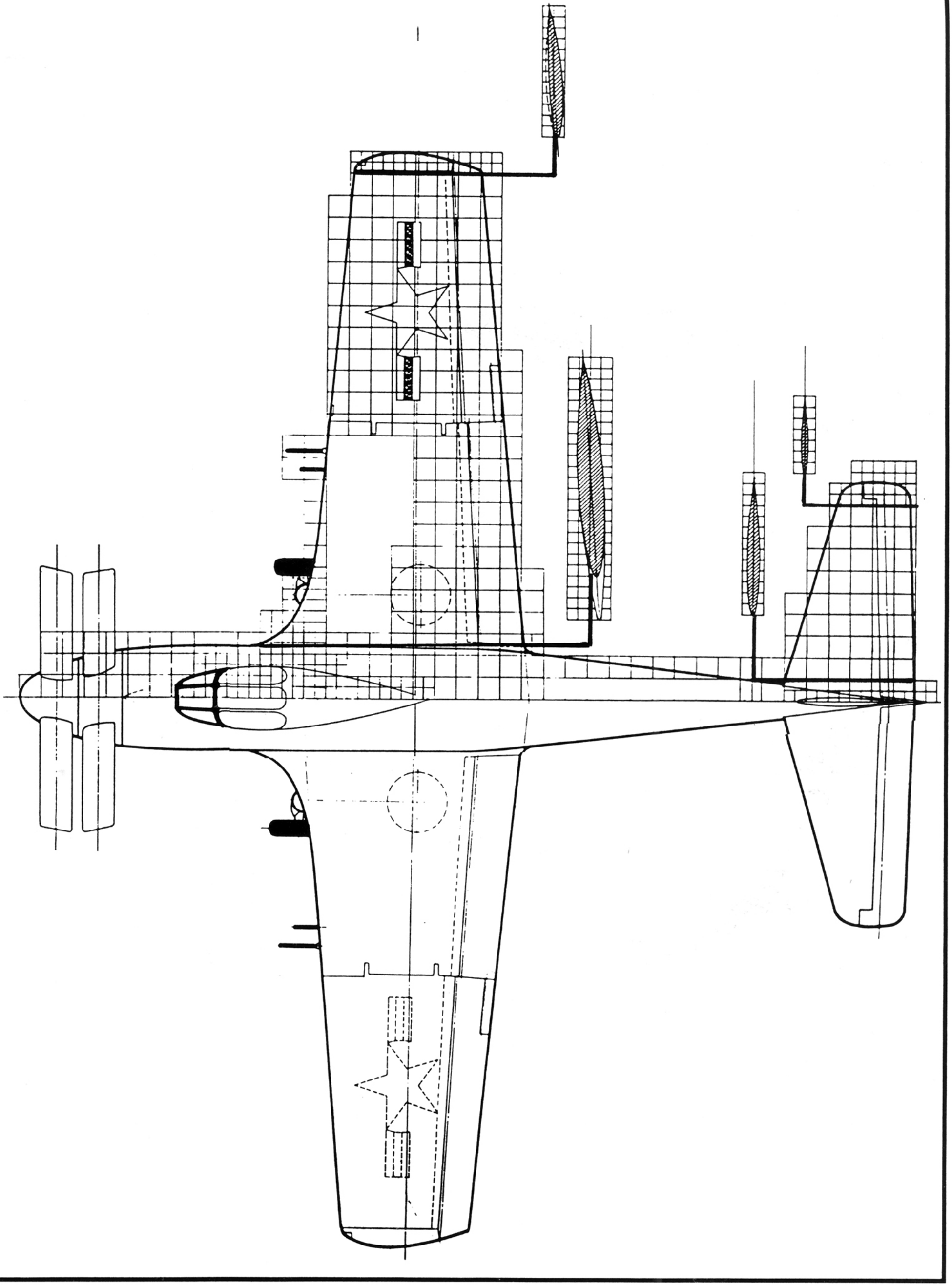
6 K-55219 SCREEN-ENGINE GROUND RUN-UP

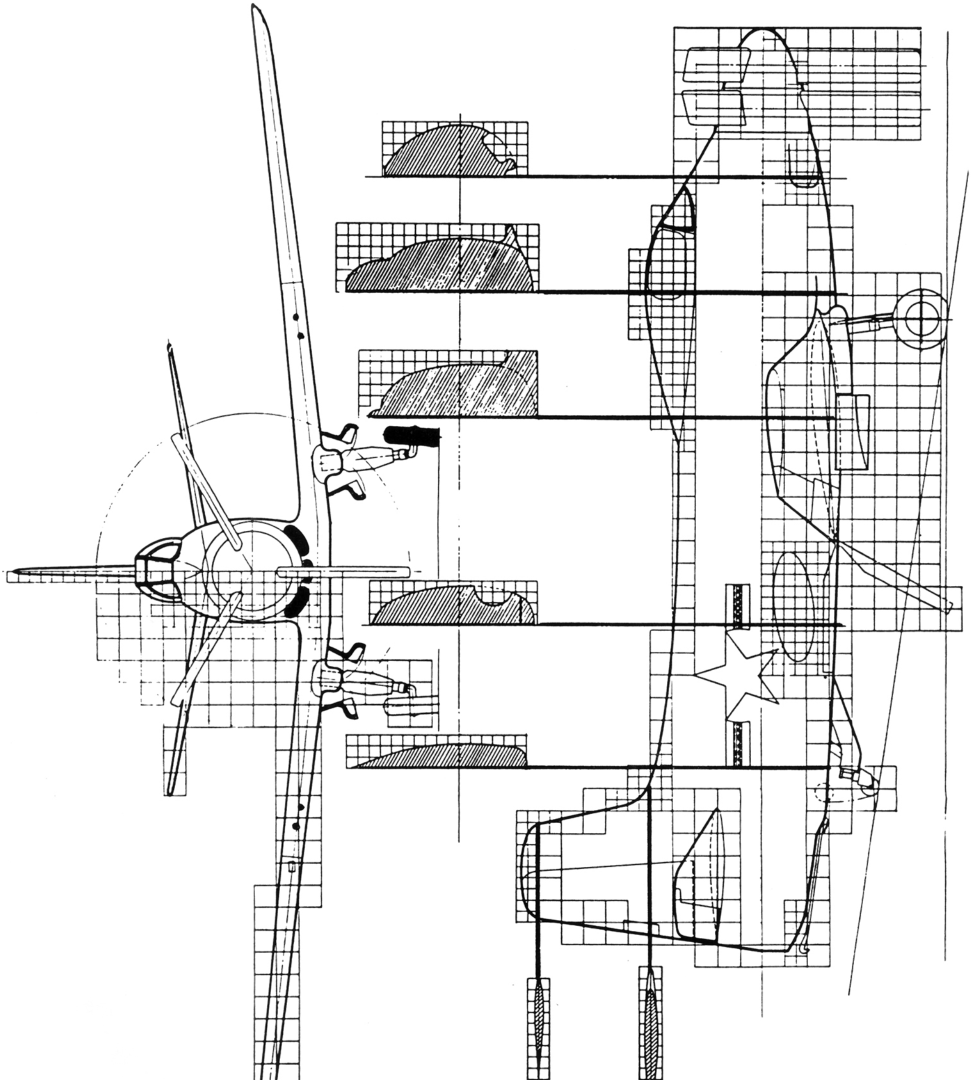


FUSELAGE DIMENSIONS





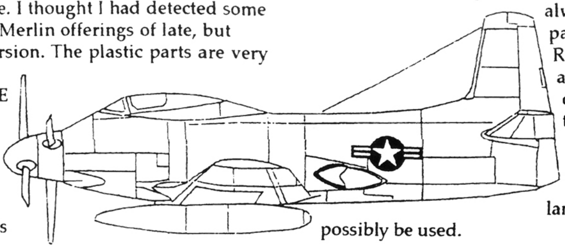




DOUGLAS A2D SKYSHARK IN 1/72 SCALE BY MERLIN

ORIGINALLY PUBLISHED IN IPMS WASHINGTON, DC PRI-FLY

by Jim Burridge

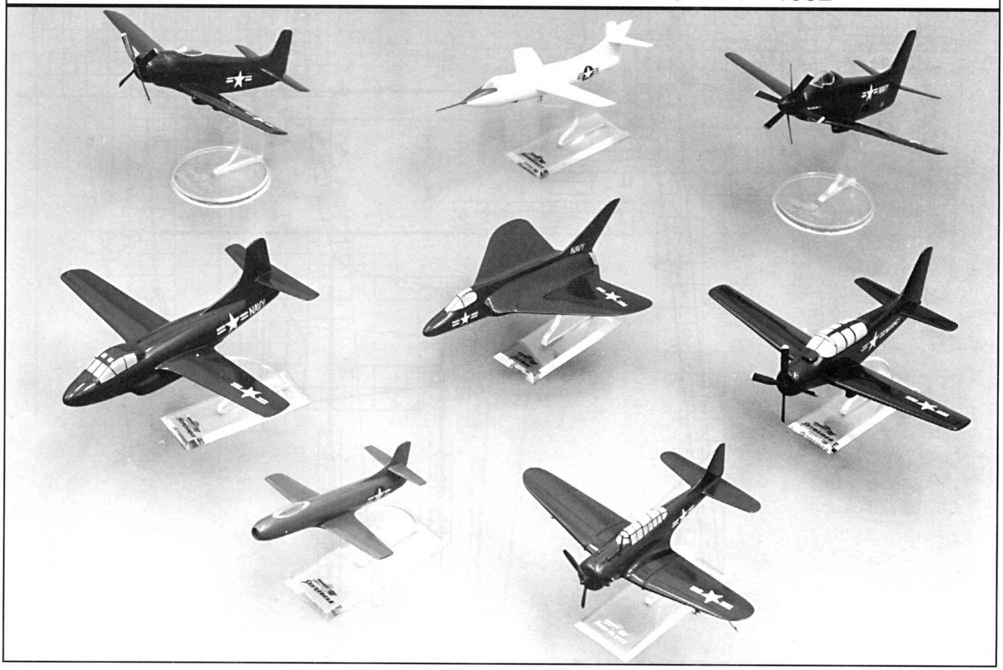


I nominate this dog as worst Kit of 1995 with considerable confidence. I thought I had detected some slight improvement in Merlin offerings of late, but this is a complete reversion. The plastic parts are very crudely molded, with heavy flash and HUGE molding sprues. There are no tongues or slots, and every major joint is a butt joint. A real canopy as pitted and scored as the one in this kit would make every flight IFR, regardless of weather. The canopy is so bad that Hannants, Merlin's distributor, put this note in the kit: Because the injection moulded canopy supplied with this kit is so badly produced we have decided to enclose a FREE Rareplanes vacform canopy with each kit. But they put the Rareplanes canopy in the zip-loc bag without any backing, guaranteeing that it would get squashed. Thanks for the free canopy, guy.

But the real show-stopper is the metal parts; not unaware of Merlin's previous efforts, I figured I could always use the metal parts with the Rareplanes kit I already had. But most of them are unusable--the prop blades and spinner are full of dents and pits. Out of the entire kit, only the landing gear could possibly be used.

And the decal sheet! Hard to believe, but they took the sheet from their FJ-1 Fury kit and cut off the obviously wrong parts. But they left on the FJ-1 Bureau Number--120348. (The Bureau numbers for the real Skysharks were 122988 and 122989.) Enough. This kit is a disgrace, and Hannant's should simply have told Mr. Merlin that it wasn't good enough to market. The Skyshark was a neat but weird airplane, and I wouldn't be surprised to see it done by MPM or Maintrack, which are sort of aficionados of strange aircraft.

DOUGLAS NAVY DISPLAY MODELS IN 1952



AIRMODEL XA2D-1 1/72 VACUFORM KIT NUMBER 292

airmodel 1:72 KIT 292

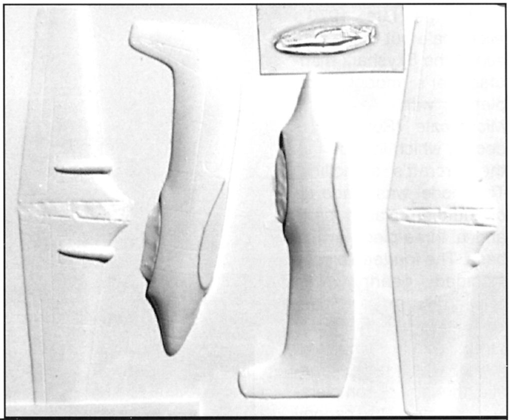
DOUGLAS XA2D-1

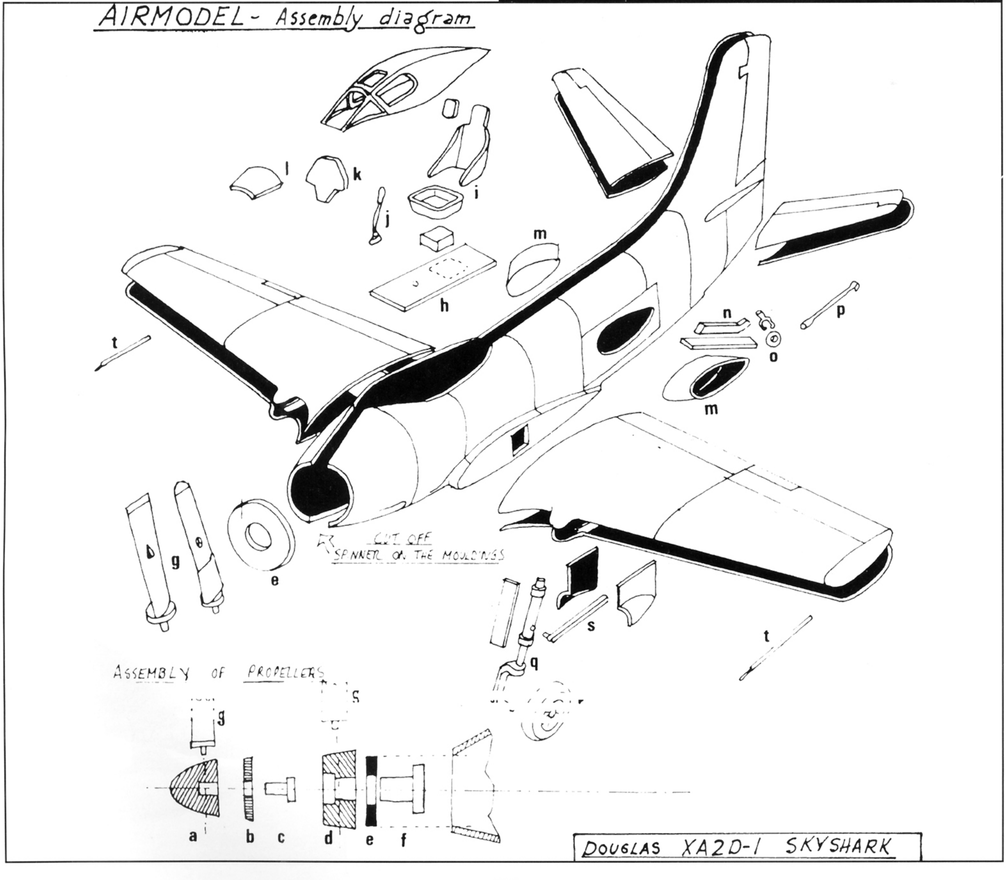
SKYSHARK

The first 1/72 scale Skyshark model was the Airmodel vacuform kit from the early 1970s. The kit was not built for review in this book, as the masters were made from extremely flawed drawings and one would be better off scratchbuilding a Skyshark. Thank goodness other kits like the Rareplanes kit have followed this one.

At right, photo of the Airmodel vacuform sheet.

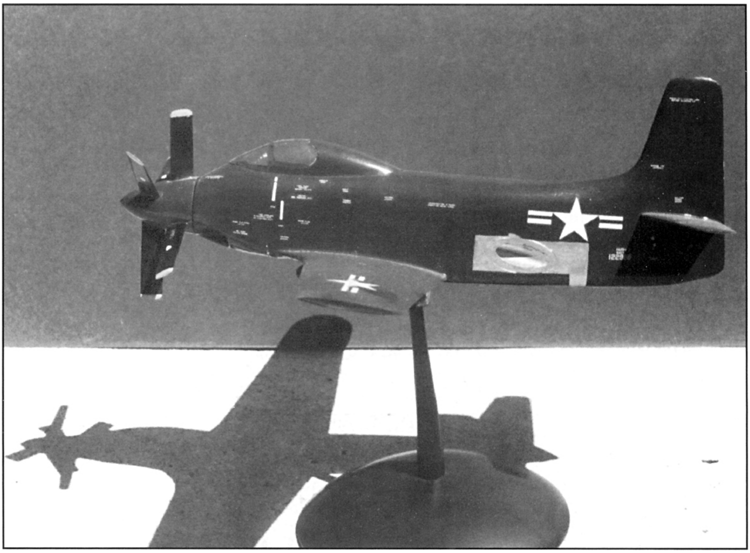
Below, the exploded construction view from the Airmodel

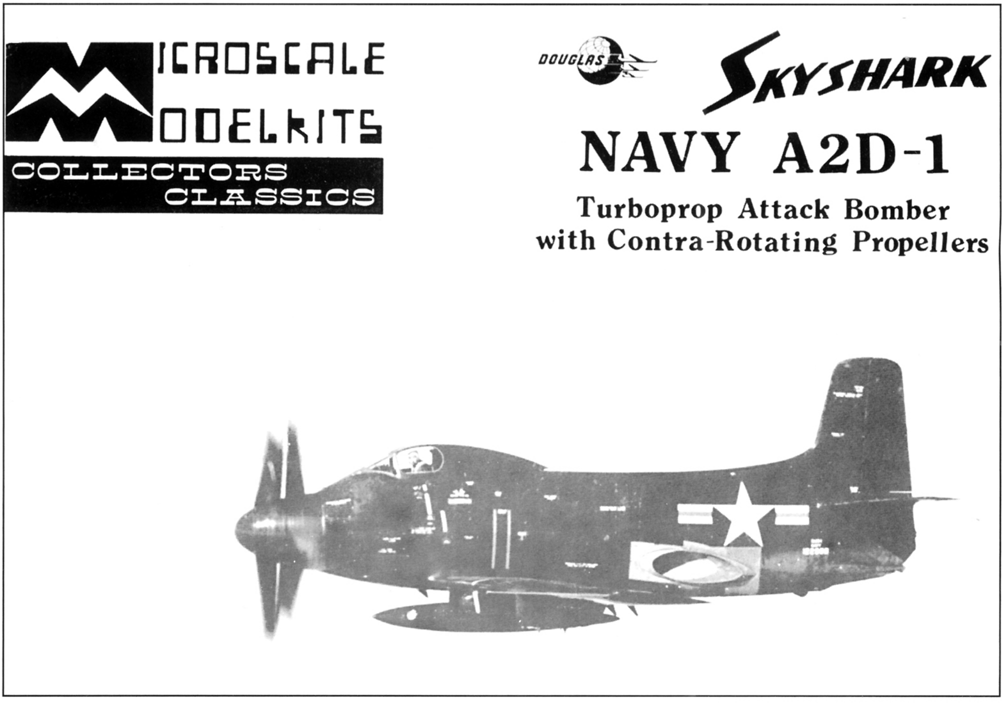




MICROSCALE MODELKITS COLLECTORS CLASSICS 1/48 SCALE SKYSHARK

In the late 1970's Microscale put out a reissue of the Skyshark manufacturer's model complete with excellent Microscale (Superscale) decals, which included all the aircraft's stenciling. The model was made up of fourteen plastic parts and a three-piece swivel base. The fourteen pieces included gearing that allowed the props to contra-rotate when they were turned. When completed, the kit was highly attractive, though not completely accurate. The canopy for the kit seems to be a cross between the one used on the prototypes and the production aircraft. All-in-al,l a great kit if you can still find one.





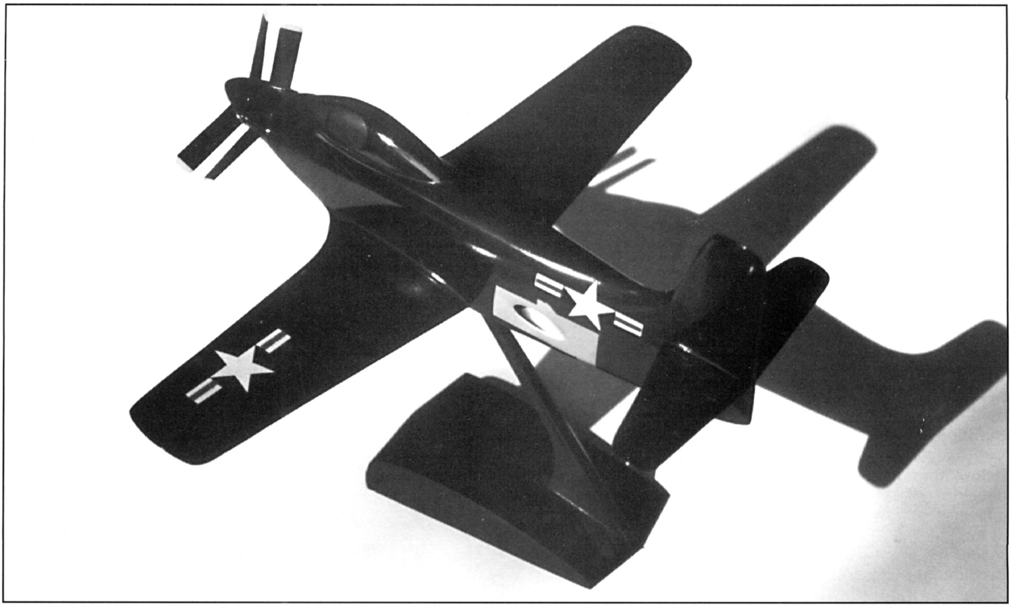
MICROSCALE
MODELKITS
COLLECTORS
CLASSICS

DOUGLAS

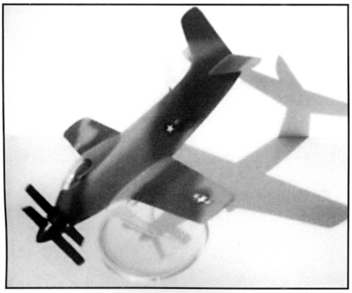
SKYSHARK

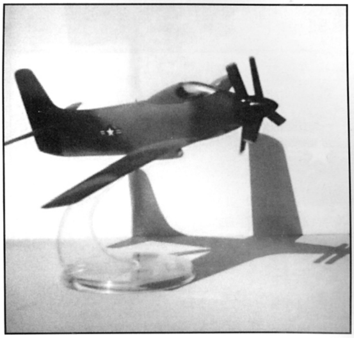
NAVY A2D-1

Turboprop Attack Bomber
with Contra-Rotating Propellers



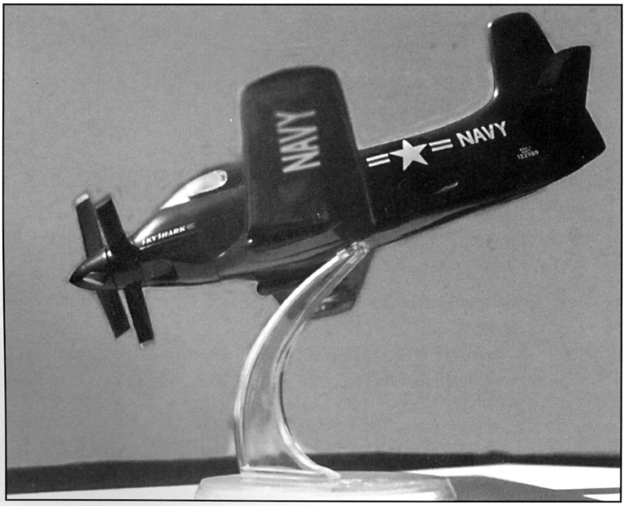
MANUFACTURERS DISPLAY MODELS





The manufacturer's model was issued in the 1950s by Allyn and except for the stand and decals it was identical to the Microscale reissued kit.

Above, painted canopy version. (via Gerry Markgraf) At left, The clear canopy version in Air Force camouflage, Below, clear canopy version in prototype markings. (via Wayne Morris)



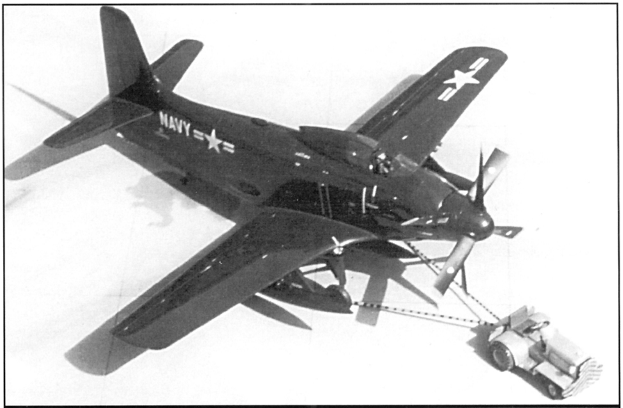
RAREPLANES 1/72 SCALE SKYSHARK

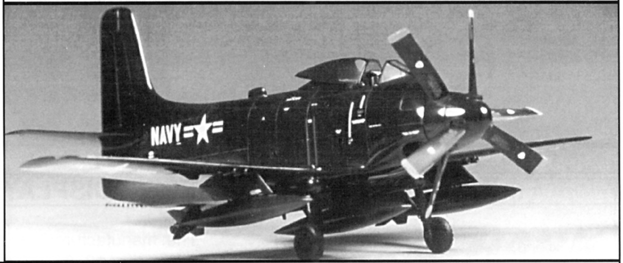
Another excellent kit from Rareplanes, the Skyshark consists of 26 vacuform parts embossed on a single sheet of heavy white plastic, and a good clear vacuform canopy. The kit also included 15 injection molded parts. These, however, were too crude and should be relaced with parts from the spares box. Realistically, only the propeller blades and the main gear wheels should be utilized. The usual excellent set of drawings is also provided.

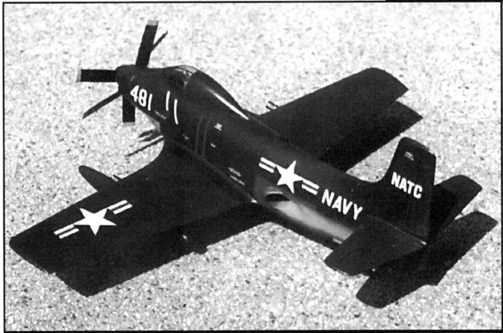
At right, three views of the rareplanes A2D built with the canopy open. (via Jim Burridge)

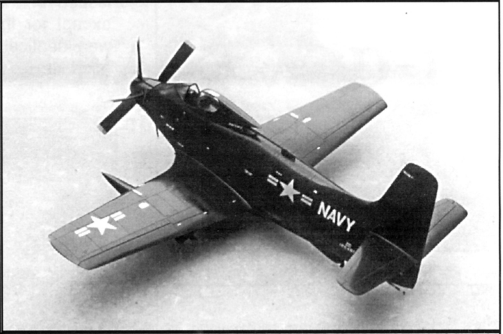
Below, three views of the A2D-1 125481 decaled as the aircraft would have appeared if testing would have continued at the Naval Air Test Center. This excellent model was built by Larry Lindberg at Brookhurst Hobbies in Fountain Valley, Ca.

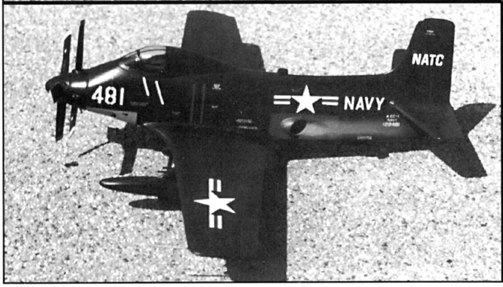
Next page, two photos of the Rareplanes A2D-1 taken on the Rareplanes instruction sheet. (model and photos by Peter Lockhart)

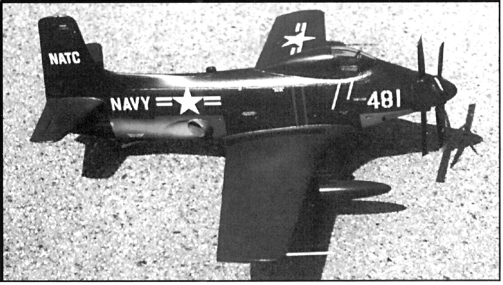


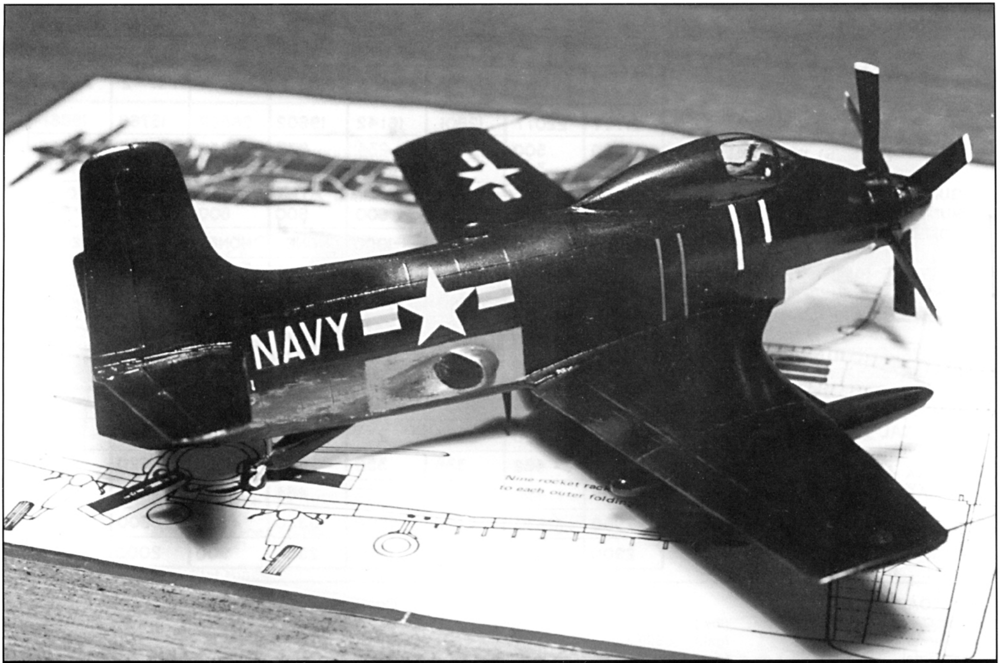


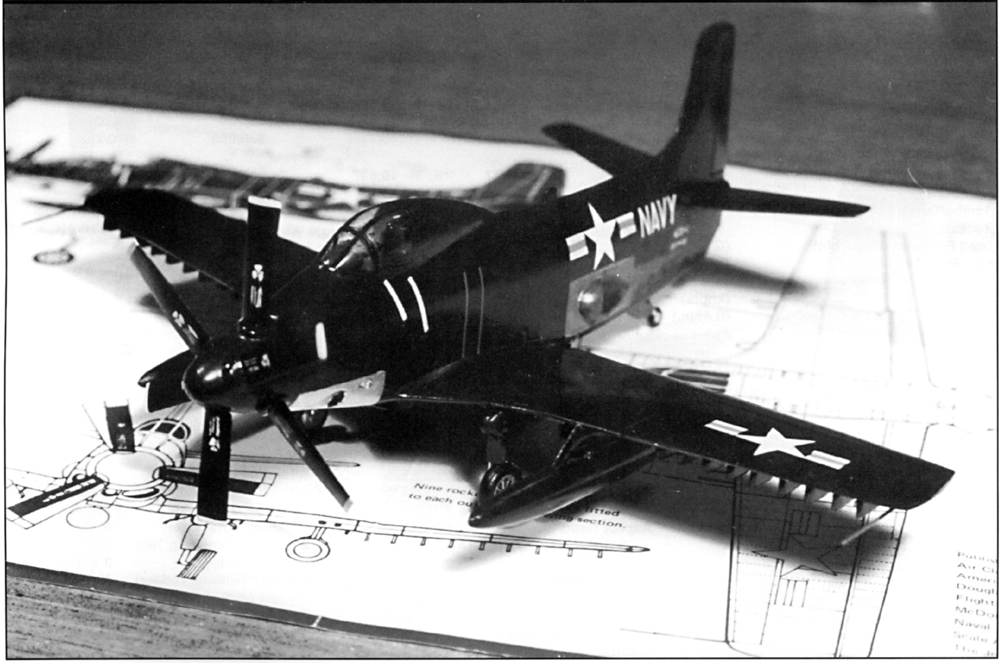









NAVY


NAVY

PERFORMANCE COMPARISONS, XA2D-1 & VARIOUS NAVAL AIRCRAFT

LOADED CONDITION	AIRPLANE							
	XA2D-1 PRES. ENG.	XA2D-1 FUT. : ENG.	F8F-2	F4U-5	F2H-2	F3D-1	F9F-2	AD-4
TAKEOFF GROSS WEIGHT	21777	22077	12801	16142	19602	26869	15768	18861
FUEL (GALLONS) INTERNAL	500	500	185	234	877	1350	683	380
EXTERNAL	300	300	200	300	400	300	240	300
GUNS & AMMUNITION	4-20 MM	4-20 MM	4-20 MM	4-20 MM	4-20 MM	4-20 MM	4-20 MM	4-20 MM
NUMBER OF ROUNDS	800	800	800	800	800	800	800	800
BOMBS	1-2000	1-2000	1-1000	1-1000	NONE	NONE	NONE	1-2000
TAKE-OFF RUN 25KTS. WIND	430	402	410	680	1300	1620	1075	430
COMBAT RADIUS/V CRUISE	*500/400	475/400	430/180	598/185	529/400	540/370	500/395	725/180

COMBAT CONDITION
(NO EXTERNAL LOAD)

COMBAT WEIGHT	16392	16692	10337	12883	14728	22609	12571	14716
INTERNAL FUEL GALLONS	300	300	185	234	526	990	410	380
V MAX AT SEA LEVEL	415	462	336	350	517	478	520	318
V MAX AT 35,000 FEET	436	452	357	382	464	444	468	278
FT./MIN. RATE OF CLIMB AT SL.	7960	10670	4450	4200	8350	4600	6800	4400
FT./MIN. RATE/CLIMB AT 35,000	2900	4500	900	1490	2500	900	2000	370

A2D-1 LOADING CONDITION		Cond. 1	Cond. 2	Cond. 3	Cond. 4	Cond. 5
Take-off Gross Weight	(lbs.)	17,592	19,647	21,777	24,065	24,780
Fuel Internal	(gal.)	500	500	500	500	500
Fuel External	(gal.)	None	None	300	300	300
Stalling Speed, Power Off	(knots)	87.3	92.3	97.2	102.1	100.0
Take-Off Distance at Sea Level	(ft.)	465	620	800	1,070	1,280
Hot Day	(ft.)	705	930	1,210	1,575	
Distance over 50 Foot Obstacle	(ft.)	940	1,200	1,500	1,880	2,580
Hot Day	(ft.)	1,350	1,720	2,150	2,680	
Normal Power Rate Of Climb S.L.	(ft./min.)	6,390	5,620	4,890	4,170	3,870
Normal Power Service Ceiling	(ft.)	48,300	45,800	43,000	39,700	38,200
Combat Radius	(n.mi./knots)	445/294	420/299	730/303	580/299	470/282
COMBAT PERFORMANCE AT MILITARY POWER						
Combat Weight at 60% fuel	(lbs.)	16,392	18,447	19,637	21,925	
Fuel State	(gal.)	300	300	480	480	
Bombs/Tanks		None	1-2,000/None	1-2,000/2-150gal.	1-2,000/2-150gal.	None/2-150gal.
Rockets		None	None	None	16-5" HVAR	22-5"HVAR
Load Factor at Drop Point	(G's)	7.50	6.91	6.49	5.82	
Max Speed at Sea Level	(knots)	415	406	398	364	
Max Speed /Altitude	(knots/ft.)	439/22,500	433/24,500	427/26,000	400/31,500	
Max Speed at 40,000 ft.	(knots)	428	421	414	375	
Rate Of Climb at Sea Level	(ft./min.)	7,960	7,010	6,480	5,430	
Combat Ceiling	(ft.)	48,400	45,500	43,900	40,300	

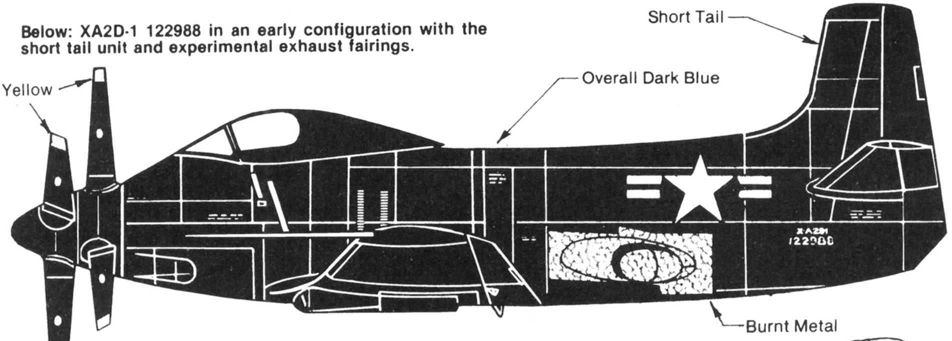
A2D-1 AIRCRAFT DIMENSIONS

GENERAL	
WITH WING SPREAD:	
Span	50’
Length	41’5-5/32”
Length (tail wheel down)	40’9-3/16”
Height	18’11”
Height (tail wheel down)	15’3-1/2”
Propeller Ground Clearance	14.5”
WITH WING FOLDED:	
Span	25’6”
Height	16’9”
Max Height During Folding	18’9-7/16”
WING	
Type	Low Wing
Airfoil Section (curve ID)	NACA-0012
Chord at Root Section	119.950”
Chord Near Tip	68.9”
Incidence:	
At Root Section	4 degrees
At Construction Tip Section	2 degrees
Dihedral	6 degrees
Sweepback at leading edge	5°19min.
Aspect Ratio	6.24
HORIZONTAL STABILIZER	
Span	20’2”
Maximum Chord	6’.3”
Incidence	0 degrees
Dihedral	10 degrees
FUSELAGE	
Width	4’9.5”
Height	7’0”
Length (without engine)	36’8”
AREAS	
Wing (less ailerons)	365.38sq. ft.
Wing (with flaps extended)	365.38sq. ft.
Ailerons (aft of hinge)	35.62sq. ft.
Aileron Trim Tab (LH side)	1.12sq. ft.
Wing Flaps	37.50sq. ft.
Horizontal Stabilizer	91.32sq. ft.
Elevators (including Tab)	23.86sq. ft.
Elevator Trim Tab	0.87sq. ft.
Fin Area (without rudder)	40.5sq. ft.
Rudder (including Tab)	14.2sq. ft.
Rudder Trim Tab	0.49sq. ft.
Speed Brake	17.0sq. ft.

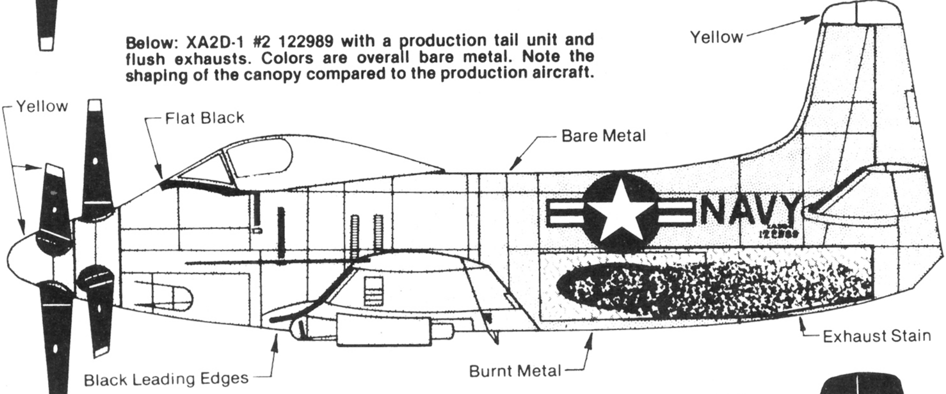
A2D 'SKYSHARK'

RESEARCH & ARTWORK BY CRAIG KASTON

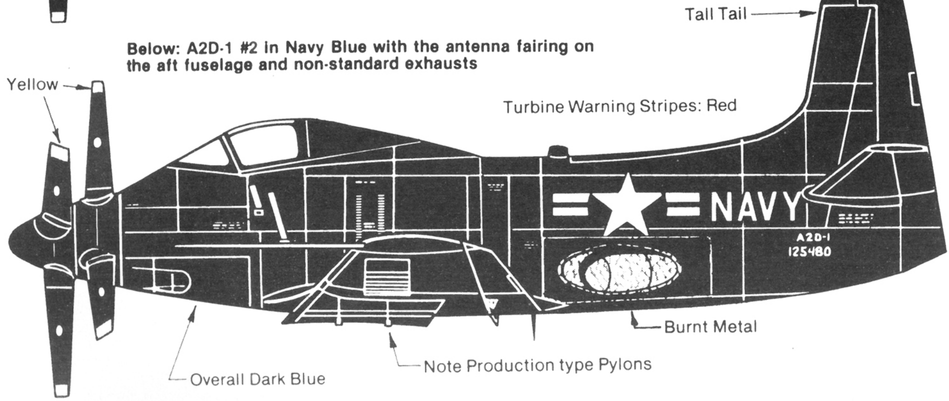
Below: XA2D-1 122988 in an early configuration with the short tail unit and experimental exhaust fairings.



Below: XA2D-1 #2 122989 with a production tail unit and flush exhausts. Colors are overall bare metal. Note the shaping of the canopy compared to the production aircraft.



Below: A2D-1 #2 in Navy Blue with the antenna fairing on the aft fuselage and non-standard exhausts



(EDITOR'S NOTE: DRAWINGS ARE FOR COLOR REFERENCE ONLY. OUTLINE IS NOT ACCURATE)